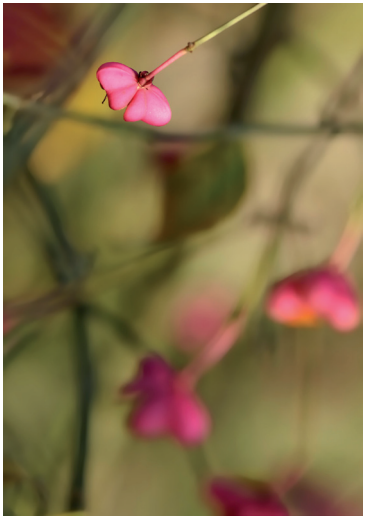

Landscape facets
Reflections and proposals for the implementation of the European Landscape Convention

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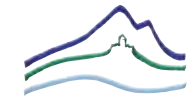

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Preface

The Council of Europe European Landscape Convention (ETS No. 176) is a groundbreaking international treaty adopting an approach to spatial development that takes account of the landscape, in other words the quality of the environmental life of individuals and societies, in keeping with the Council of Europe's concerns with regard to human rights and democracy. It does this by recommending that member states involve the public in all stages of landscape policies.

Since the European Landscape Convention was adopted by the Committee of Ministers of the Council of Europe in Strasbourg and opened for signature in Florence in 2000, the Council of Europe has examined and illustrated some of the themes relating to the convention, in other words certain facets of the landscape:[1]

- landscape, towns and suburban and peri-urban areas;
- landscape and transport infrastructures: roads;
- road infrastructures: tree-lined avenues in the landscape;
- European local landscape circle studies;
- landscape and education of children;
- training of landscape architects;
- landscapes and ethics.

This publication is a collection of the relevant reports drawn up by Council of Europe experts in the light of the conclusions of the meetings of the workshops for the implementation of the European Landscape Convention.[2] These reports were also presented at the Council of Europe conferences on the European Landscape Convention, held at the Palais de l'Europe in Strasbourg on 22 and 23 March 2007,

1. See the previous publication, *Landscape and sustainable development: challenges of the European Landscape Convention*, Council of Europe Publishing, Strasbourg, 2006, ISBN 972-92-871-5988-5.
2. The proceedings of the meetings of the Council of Europe workshops for the implementation of the European Landscape Convention have been published by Council of Europe Publishing in the collection European spatial planning and landscape, and these are available on the European Landscape Convention Internet site: http://www.coe.int/Europeanlandscapeconvention.

and 30 and 31 March 2009. The representatives of governments and of international governmental and non-governmental organisations that attended these conferences had the opportunity to discuss the relevant issues and to take the first steps towards optimum implementation of the convention.[3]

Following the order in which these reports were presented, we would like to express our gratitude to the experts for the high quality of their work and for their important contributions: Mr Diedrich Bruns, Mr Ignacio Español Echániz, Ms Chantal Pradines, Mr Terry O'Regan, Ms Benedetta Castiglione, Ms Ingrid Sarlöv-Herlin, Ms Marina Kuleshova and Ms Tamara Semenova.

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Chair of the 5th and 6th Conferences of the Council of Europe on the European Landscape Convention
Head of the Landscape Office, French Ministry of Ecology, Energy, Sustainable Development and the Sea

3. Conference reports: Documents T-FLOR (2007) 14 and CEP-CDPATEP (2009) 19.

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II. Infrastructure and landscape: roads

Ignacio Español Echániz, Council of Europe expert

Summary

The aim of this report is to provide a starting point for discussing the role of roads in landscape. The European Landscape Convention draws attention to the landscape quality of all places and the need to improve and enhance them through all public policies. Roads are not only infrastructures which take us to landscapes; they also provide positive scenic routes through landscapes, as well as enjoying landscape values and a character of their own. Additionally, roads are collective spaces where everyday community life takes place. They must therefore be considered as community landscapes and managed accordingly. Road planning and management schemes have a part to play in landscape management and they must be seen positively. Recently, many positive initiatives have taken place in this field: roads as scenic routes, road design for character and landscape enjoyment, and road integration into landscape.

This report reviews the landscape qualities of roads, taking their different aspects and implications into consideration. First, the role of travel in attitudes towards contemporary landscape is briefly discussed. Then, access to landscapes and the values of road itineraries are reviewed. The next section deals with the perception of landscape from a vehicle and looks at all factors involved from the scenic itinerary to alignment and drivers' attention.

The following section focuses on road design for landscape, that is, both aimed at sustaining a sense of identity and character for the road and providing facilities for the enjoyment of landscape other than from within a vehicle. Another section approaches the question of road integration within landscape, both environmentally and visually. Finally, it is argued that there is a need to consider the landscape value of all roads.

The report is completed with four brief appendices, which deal with experiences in road management and design. The first appendix presents the role of roads in a nature park, the second deals with the cultural and natural values of itineraries, the third is about road alignment and integration into the landscape, and the fourth presents a road design for landscape enjoyment.

Ill. 1: *Painting a water-colour at Ryde Beach, Isle of Wight, England. Visual aspects are fundamental in a personal and cultural approach to landscape (photograph by the author; unless otherwise indicated, all the photographs have been taken by the author)*

Introduction: travelling, landscape experience and roads

Landscape experience as a cultural attitude

Landscape is a dual product of cultural attitudes. On the one hand, communities' needs and knowledge have shaped land and created landscapes, while, on the other, social attitudes, cultural viewpoints and ideals determine a community's perception of physical environment.

Early civilisations, which were obviously heavily dependent on the availability of natural resources, had a dramatic view of their environment, while more sophisticated cultures tended to idealise environmental processes through complex intellectual approaches. Landscape, in its current sensual and artistic sense, is in large part the result of the ideals of European society. Western idealisation of land had a marked Eastern influence. Nevertheless, with the advent of industrialisation a productive view of the environment and its profitable resources was added to this idealised view of nature. Later, increasing environmental awareness accompanied reactions against standardisation and loss of identity. Current attitudes towards landscape involve a dual view of both the reality of processes shaping the land as well as the sensual and artistic perception of their scenic results.

Contemporary attitudes and visual aspects

As a result of the increasing influence of mass media and dynamic communication systems, global society is developing new attitudes towards landscape. These tend to emphasise visual aspects rather than a more comprehensive view of its environmental processes. To a great extent, the visual enjoyment of

landscape is replacing other kinds of landscape experience. Several factors are involved in this process, such as:

- the original 18th-century approach to landscape resulted from a visitor's view of local reality; that is a "view from afar" attitude where idealisation, and formal and visual aspects play the main role;
- landscape has become a by-product of consumption within tourist and cultural businesses as well as a regional identity icon;
- the representation of reality through images is very effective in the competitive and dynamic information markets of today;
- simplification of landscapes into mere images provides a deceptive approach to the real complexity of cultural and natural features of communities and their lands.

Travelling and landscape experience

The rapid development of means of transport during the previous century played a major role in shaping attitudes towards landscape. Travelling is deeply rooted in the traditional Western sense of landscape, since travellers set the basis for the concept in the 18th and 19th centuries in Europe. Later, 20th-century improvements in transport provided people with better access to a wider and more diversified range of landscapes. Furthermore, transport has encouraged urban sprawl which, in turn, has created new approaches towards urban landscapes.

Long-distance travel takes tourists and visitors from very different cultures and environments to places where they experience landscape and other local values. In addition, day-to-day travelling experiences involve quite a varied range of landscapes through routine transport systems in conurbation areas as well as in rural regions.

Thus, environment is mostly perceived through the windows of cars, buses, trams and trains. Citizens of modern society spend a considerable part of their time in vehicles. This applies not only to everyday landscapes where citizens carry on their daily lives but also to those areas that are protected and distant. Landscape in these pristine or exotic areas is highly valued, but time to visit and enjoy them is generally limited.

Interest in landscape as a threat to landscape preservation

The number and diversity of landscapes available to people have increased due to the development of means of transport. However, the experience people gain from these landscapes has become increasingly simplified, to an almost exclusively visual event. Package tours and other means of fast travel are a good example of this. Specifically, scenic routes allow car travellers to view landscapes from the road as they drive.

This emphasis on visual aspects tends to overshadow more complex cultural and environmental values and processes. Actually, awareness of these processes is crucial since they are responsible for the maintenance of landscape values while preservation policies result from that public awareness.

Moreover, there is a dangerous vicious circle which involves transport infrastructure and landscape values at the same time. Roads and other transport means are still seen as basic infrastructure in development. This argument applies particularly to those pristine areas in which cultural and natural landscapes have been preserved due to lagging development.

Thus, road itineraries are envisaged for cultural tourist development based on the preservation of that very landscape that is degraded firstly by road construction, and later by resorts developed because of increased accessibility. Co-ordination between development policies, infrastructure planning and landscape management must be guaranteed.

Ill. 2: *Bad quality road at Jandia Peninsula (Fuerteventura, Spain). The poor quality road prevents human pressure and development on special landscapes such as this volcanic massif*

1. Roads and landscapes

1.1 Roads and landscape values

Infrastructure's main goal is to satisfy community needs within a given environment. Its alignment and structure result from applying technology to environmental resources in order to satisfy social needs. Specifically, roads serve mobility within a territory so that they belong to the general structure, organisation and processes of that territory. They are thus narrowly related to the cultural and natural aspects of land and landscape.

Therefore, roads enjoy different landscape values which are related to their linear nature and how this linearity involves landscape resources. Accessibility, and scenic and environmental qualities of roads contribute to all these landscape values.

In the first place, roads provide good, fast and safe access to different places, communities, environments and their landscapes. Good accessibility to landscapes gives freedom of choice, which, coupled with the availability of information, can result in a more profound landscape experience and knowledge.

Second, road itineraries have values of their own, since they have developed as part of landscape dynamics and, as such, reflect the cultural and natural aspects involved in those processes. Historic routes, geographical barriers and environmental diversity can be appreciated along road itineraries.

Third, roads can be considered as windows onto a landscape: they take observers across landscapes which are viewed from the road. Roads have a so-called "scenic quality". Moreover, the view from a road gives a fair first impression of a landscape, which can be experienced later in a wider and deeper sense, once the car is parked.

Fourth, though functional and highly standardised, roads like any other public places have a character of their own which to some extent reflects the community and the culture where they belong.

Finally, roads take part in landscape scenery, being present as a specific element which can be perceived and appreciated. The integration of roads into environmental processes and landscape scenery is crucial in guaranteeing landscape values. After all, roads are flexible infrastructures which can be integrated into landscape with not much effort during design and planning.

Ill. 3: *The view from the road approaching Ragusa's new town (Sicily, Italy) invites one to get to know the town better. Roads provide scenic views as well as access to landscapes, and in doing so they often make an inviting and quite exciting introduction to a more involved and detailed visit after parking*

1.2 Access to landscapes: planning and management

Roads provide access to communities and places, and also to landscapes. In doing so, they allow sightseeing as well as providing a first approach to those areas that will be subsequently explored. This key visual and scenic quality will be discussed later in this chapter.

However, road accessibility to areas of interest can be a threat to landscape preservation, if subsequent pressure and development are not duly controlled. Lack of access and reduced accessibility are quite efficient measures to prevent undesired damaging effects on pristine areas.

An efficient road network will guarantee proper access to visitable areas, which could satisfy visitor demands without putting exclusive resources in danger. Moreover, a careful selection of scenic roads can provide a good introduction to areas and satisfy some visitors' demands, while keeping pressure away from the most sensitive areas.

Landscape and road management and planning must work together. Accordingly, road network plans must be co-ordinated with landscape enjoyment and preservation goals. They should be aimed at compromising development and preservation selectively, taking into account the specific conditions of each case. Although no general rule can be applied, the use of measures to deter access should be considered together with encouraging access to those areas specially selected for visitors in an appropriate landscape plan.

1.3 Itinerary values

Driving by car has become such a dull and routine activity that one almost ignores the sense of variation that logically comes from any movement. The road environment can be merely functional and standard. It generally adopts the characteristics of a "non-place" space where reference to land and values are often limited to signposting. Moving along these linear infrastructures, particularly on motorways and other high-speed roads, has been progressively detached from a sense of travelling through places and land.

However, road itineraries are the result of geographical, environmental and cultural processes, and can be perceived as such. Following road itineraries unveils essential values which are related to cultural, historical and natural features of the land and therefore of its landscape. Large geographical units and territories can show themselves along a long-distance road if its different features are appreciated. Mountain barriers, river valleys, high plateaus or coastline provide the physical base for road itineraries. Thus, climate diversity, geological structures and features, ecological phenomena and geographical variations can be traced along those itineraries.

Ills. 4 and 5: *(Left) Paths, roads and land boundaries intermingle in this view of Arco San Jorge, Madeira (Portugal). (Right) Land plots and a road on the island of Gozo, Malta. Road itineraries, alignments and full networks develop as part of landscape patterns and dynamics, as roads are the result of cultural and environmental processes*

Most current road itineraries are the result of ancient historical processes. Some local roads, which at present serve only small rural communities, were once main tracks for political and social systems that have long since disappeared. The road network of the Roman Empire is a good example of this. Long-distance religious pilgrimage routes, cattle transhumance itineraries, old trade routes and the expansion axes of cultural influence along valleys can still be traced today. Thanks to mechanisation and new means of transport, the processes of industrialisation reorganised the movement of people and goods in European geography, producing new itineraries, abandoning previous ones and the rediscovery of those which had been forgotten. Later, the development of motor vehicles and other means of transport once again reshaped movements.

Ill. 6: *The LP-1 road on La Caldera de Taburiente (La Palma, Spain) – a traditional itinerary for communities predating colonisation and also for transhumance – provides an impressive view from the island's heights as well as of volcanic formations and original ecosystems*

Although these cultural and geographical itineraries are not always directly visible in landscape, they are most valuable. They are cultural and environmental assets in themselves, as well as a means to achieve self-awareness, since they promote people's appreciation and concern for their environment, history and culture through landscape perception.

Thus, understanding the features of these special routes becomes very valuable. This approach to road itineraries must be adequately supported by different sources. The availability of information, such as that provided by maps, guides, signposting or visitor centres, can be very effective in illustrating these routes. Moreover, an appropriate management of both the scenic quality of roads and their relationship to landscape features can be very productive.

Special landmarks and features of various types play a main role in supporting an understanding of road itineraries. Cultural and natural elements and features that are visible in the environs of a road are thus important. Preservation of historic and cultural built elements close to or attached to roads, such as bridges, post houses, blacksmiths, milestones and old tracks, can be useful in this sense. A wide range of landscape features, such as vegetation, relief and rocks, rivers and water bodies, crop patterns and plots, etc., are thus important in supporting the visual perception of road landscapes.

Therefore, a comprehensive integration of key elements, landmarks and landscape features within the travel route is required. Co-ordination of available information and adequate signposting, with highlighting of scenic views and the role of stopping areas and landmarks, should form part of an integrated policy for the enhancement of itinerary values.

2. Landscape perception from the road

2.1 Roads as windows on landscapes

At the start of the 20th century, the scenic qualities of roads were being exploited by road planners. Scenic roads, parkways and landscape roads were planned and built for landscape enjoyment, that is, from the viewpoint of a moving vehicle. Landscape appreciation was assumed to be a main goal in planning a road. Their placement was designed to optimise views and panoramas, much like paths within landscaped gardens. Roadside landscapes were also specifically designed to be viewed from the road.

Nowadays, the scenic qualities of roads are fully taken into consideration by road planners and landscape managers. Viewing landscapes from roads is now very popular. Environmental concerns, tourist interests and a general demand for infrastructure of a better quality have favoured this approach to roads as visual itineraries.

Road maps generally include scenic itineraries and viewpoints are often signposted along main routes.

Nevertheless, selection criteria for scenic routes on maps and signposting are rarely clear, consistent or specified. Furthermore, landscape viewing from a moving vehicle is a very complex process, which is often dealt with in a simplified way. A very varied group of considerations must be carefully taken into account if landscape viewing is to be promoted.

These can be grouped into three main sets as follows:

- aspects related to landscape scenes viewed from the road and their management;
- scenic features of the itinerary such as the location of viewpoints or the need to obtain an adequate series of views; and
- aspects related to drivers' and travellers' attention and their relation to traffic safety.

Ill. 7: *The spire of Salisbury Cathedral, a main landmark, welcomes incoming traffic to town (Wiltshire, England)*

2.2 Roads as scenic and visual itineraries

Scenic roads should be viewed within comprehensive landscape management schemes. Roads benefiting from views onto quality landscapes should always be managed within goals and schemes devised for those landscapes. Inversely, the main resources of a landscape, such as panoramas, viewpoints and landmarks, can be positively promoted by means of scenic roads.

In addition to considerations of spatial planning of roads and landscape, the content and structure of the views should also be taken into account when a visual itinerary is

being planned. Landmarks play a main role in landscape perception and reading since they provide recognition keys to drivers and travellers who are to benefit from landscape viewing. Often, the availability of landmarks becomes a good enough reason in itself to prefer a visual itinerary to one in which there are no recognisable features.

Ill. 8: *Road alignment leads the direction of sight to the landscape providing a fast succession of views. Movement gives a sense of landscape depth along the road itinerary*

Factors related to the scenic properties of roads are therefore very important. In the first place, roads are part of the landscape's three-dimensional scene so that road itineraries provide a series of sights. Fast succession of views gives road travellers a sense of landscape continuity and depth. Therefore, moving views from a vehicle become both emotional and informative. Though usually fast and superficial, the experience is much appreciated by road users.

Road itineraries have a precise scenic location within the visual organisation of landscapes. Different itineraries provide different views of the whole scene and of the structure of landscape. Routes on the slopes of narrow valleys, although lacking visual access to the valley floor, provide a relatively complete view of the valley landscape, while routes on the valley floor itself provide viewpoints upwards. Depending on the scenic structure, special landscape landmarks and other items can be viewed from some viewpoints while they will be hidden from view on other itineraries.

Ill. 9: *A pedestrian's view from a security barrier at a roadside allows for a view of the landscape. The little dam on the right, a main landmark in this landscape, can hardly be seen from a car, but walking along this road is very dangerous*

Therefore, not all roads provide a good view of landscape. It depends on how the itinerary is integrated within the three-dimensional scene. Specific scenic features of roads must be taken into account very carefully if their landscape qualities are to be developed.

"Visibility" is a feature of roads that allows drivers to see the road ahead, so they can adapt their vehicle movement and speed to the approaching stretch of road. Roads which enjoy good visibility clearly show their alignment to drivers for several hundred metres, while bad visibility is typical of curved roads the next stretch of which is hidden behind a bend or the brow of a hill. Good visibility in roads is always desirable for safety reasons, especially in those roads which are designed for high-speed traffic where long stretches must be visible to drivers.

Ills. 10 and 11: *Driving safely along difficult sections, such as the steep and curved roads shown in the pictures above, requires better visibility of the road ahead, so tall roadside vegetation has been removed*

The quality of road visibility can be spatially extended to the perception of landscape ahead on the road and beyond. Therefore, some roads, the sides of which are occupied by long, solid barriers of objects (such as trees, buildings or relief), hide the landscape, while open roadsides allow travellers to perceive the landscape around and ahead.

The visibility of verges and roadsides is important when devising a visual itinerary, since it affects the basic visual patterns. Some considerations on this issue follow below.

Ills. 12, 13 and 14: *Landscape visibility on a road in the Cantabrian mountains (Alava, Spain). Above: good visibility for approaching stretches and landscape. Below left: bad safety features for this road hidden behind the curve and only good landscape visibility at the right side of road. Below right: bad visibility of landscape and traffic safety in this curved road along a thick forest*

Visibility of the landscape on the opposite side of the road depends on the full road width, oncoming vehicles and obstacles on the opposite roadside. Motorways and roads with high-density traffic offer little visibility of landscapes on the other side of the road. Hence, most of these roads have good landscape visibility in one direction only. Typically, roads aligned along a slope provide good views on one side (if there are not obstacles on the roadside), while the slope itself prevents views of the other side.

Commonly, landscape visibility appears fragmented along roads since the sides of some stretches will be free of obstacles while others will have visual barriers of different lengths.

Eventually, drivers and passengers get a reasonable idea of landscape from the series of occasional sights they get in between visual barriers. However, this effect can be very disrupting for sightseeing.

2.3 Road users' perception of landscape

In addition to factors related to scenic organisation of road alignment and roadsides, there is the effect of speed on landscape perception. Moreover, the different attention parameters of the road users must be taken into account.

Fast movement along a road has a narrowing effect on the breadth of vision of the driver. Objects standing very close to the roadside, such as trees and buildings, move along the field of vision of the observer almost as fast as the speed of the vehicle. This is why, when the vehicle travels fast, it is quite hard to recognise objects on roadsides. Objects in the far distance, such as mountains and forests, remain steady in the driver's field of vision, while those at a certain distance move at a low speed.

The effects of speed on depth of vision condition the driver's view of the road ahead. Higher speeds reduce depth of vision while slower movement increases it. This phenomenon affects not only the driver's view but also those of the passengers in the vehicle. Therefore, fast driving through a narrow landscape, such as in urban areas, stops a driver from seeing the environment, while travelling along wide, open stretches of road, such as in coastal areas, allows the driver to admire the landscape as long as there are not too many objects close to the road.

In relation to speed, pedestrians and those travelling in low-speed vehicles get a reasonable view of the landscape, while those in vehicles on motorways and high-speed roads can only appreciate open and distant scenes.

Ill. 15: *Road from Altsasua to Olazagutia (Navarre, Spain). Despite the impressive views available, steep and curved mountain roads prevent sightseeing*

A driver's attention to the landscape occurs within the constraints of handling a vehicle. The steeper, twistier and more visually limited a road's path is, the more attention demanded from the driver. Thus, mountain roads, which generally offer impressive views, limit a driver's enjoyment of the landscape since they normally have to tackle curved, steep and hard to drive sections.

In addition to the effort demanded by windy roads, extra attention is required when traffic density is approaching maximum road capacity, that is when traffic

is congested. Narrow roads can support limited amounts of traffic, while wide motorways with several lanes in each direction can handle high-density traffic, allowing for safe and comfortable driving.

Congested roads are usually difficult for landscape enjoyment, not only because of the visual intrusion of other vehicles, but also because drivers require extra attention to deal with other vehicles.

A driver's travel aim is also important in landscape perception, since it affects personal attitudes towards driving and landscape. Expectations and attention are higher for those exploring for the first time or those touring specifically in order to sightsee.

Those drivers habitually driving the same route have a special attitude towards road environs, which includes a special demand on landscape quality. They have a better knowledge of traffic and road features. They have a self-confident attitude towards driving. This frees up their attention so that they can admire the landscape, which in turn has a specific familiar character. The environs of roads used for commuting are seen and appreciated just as other collective social areas where community life takes place. Commuters greatly dislike landscape degradation; they are very demanding as regards quality standards, including road elements and landscape. Landscape quality is not exclusive to countryside roads in pristine landscapes; roads used for commuting must also assume a positive landscape profile.

Concentration factors also affect passengers. Personal motivation for travel, bad roads and dense traffic affect all travellers, and produce an uncomfortable and stressful travelling environment.

Consequently, smooth and safe roads with good traffic conditions are best suited for drivers' and their passengers' enjoyment of the landscape.

Ills. 16 and 17: *Road character is generally functional and standard, and thus lacks a sense of identity and place. However, there is room for non-functional design*

3. Road design for landscape character

3.1 Road aesthetics and landscape

The main aim of road design is to provide, in safety and comfort, the conditions for a certain flow of traffic. Road elements, and more generally aspects and the surrounding environment tend to be seen as merely functional, that is, are conceived and devised to serve traffic. Therefore, pavements, traffic signs, road markings and safety barriers create a special environment that lacks character and identity. Moreover, high-density traffic flows, including large numbers of heavy vehicles, make the road environment noisy, polluted and hazardous. Consequently, road structures such as lanes, pavements and roadsides are frequently unappealing and dirty.

Even those areas where travellers can get out of their vehicles, such as lay-bys, rest areas, and petrol and service stations, generally have a banal character. In those places, trademark icons and franchised styles are predominant. Where this is not the case, design is generally poor, plainly functional and very limited. Additionally, traffic conditions often preclude enjoyment of the landscape other than from within the vehicle.

Thus, a road's own landscape is often aggressive and poor, lacking landscape features, a sense of identity and character. Yet, people spend a great deal of their time in road environments because they have become part of their day-to-day lives.

The European Landscape Convention demands landscape quality for all areas including those commonplace and conventional areas such as roads and other public works. The design of infrastructure must take into account that it is perceived and can be appreciated as an important part of our community environment.

Despite its basic approach, road design can easily take quality and positive landscape goals into account without compromising safety and functionality. Furthermore, some roads can integrate side elements for specific landscape enjoyment such as scenic viewpoints, walks or parking places.

The landscape profile of roads can be improved in two different ways. First, some road design features can use landscape character as a basic reference. Second, additional side elements can allow for a better appreciation and experience of landscape rather than that obtained from within moving vehicles.

3.2 Road design for identity and landscape character

Elements of road design such as road markings, traffic signs, pavement, hard shoulder, etc., arise from the need for traffic safety. These have rigid designs since

they must satisfy strict safety standards. However, other road elements enjoy different degrees of design freedom. Safety barriers, embankments and cuttings, retaining walls, garden elements and information signposts are among the latter. Furthermore, some special structural elements such as roundabouts, bridges, parking places, petrol stations, and service and resting areas are specific areas where road character can be developed positively.

Road identity can be promoted by different design strategies. Road elements can integrate landscape character features, or assume a formal identity of their own. The latter includes different possible approaches, such as naturalisation and others.

Landscape character is based on those features which make landscape unique. In addition to large-scale aspects such as relief or vegetation pattern, features such as local trees and bushes, or traditional building materials can easily be used by road designs. In addition to characteristic references, roads can include non-conventional design elements such as safety barriers, parapets, safety bollards and others which can give a specific sense of identity to road environs.

Ills. 18 and 19: *Wooden safety barriers on roads provide a sense of the natural and rural. However, as increasingly used standard elements, they run the risk of creating a lack of identity*

Ills. 20 and 21: *Traditional parapets newly built but with an old-fashioned design (left) or preserved in their original state (right) provide a familiar look*

Supporting structures, such as retaining walls for embankments or cuttings, can play a major role in road character. Cuttings on unstable terrain require supporting elements at the base of the slope. Where normally inclined embankments are not feasible due to lack of room or other reasons, strong retaining walls are required to support the road platform. These structures are often constructed with concrete walls, standard plaque walls, or piled with heavy rocks. Although they guarantee stability, all three systems are poor in terms of aesthetics.

Traditional stone walling is a common retaining solution when quality design is implemented. Local traditional stone walls can be easily integrated into road structures, thus providing a sense of local character. Stone walling is sometimes used to give the impression of a return to nature. Generally, the retaining structure is a modern and effective system constructed with concrete or tension-supporting elements concealed under a stone wall finish.

In addition to elements within the road structure, road verges are fundamental in providing roads with a sense of character. Actually, roadside areas are places of transition between the functional and aseptic road environment and the local landscape itself. Traditional elements, such as rows of trees, traditional stone walls and others, can play this transitional role well if they are used and integrated with care.

Ills. 22 and 23: *Traditional stone walls are one of the features of a landscape. (Left) Walls made of dry limestone are a traditional feature of the island of Mjlet (Croatia). (Right) Characteristic retaining walls made of volcanic stone for vertical vineyard embankments on the island of Madeira (Portugal)*

Ill. 24: *The picture above shows a road the embankment of which is supported by a prefabricated slabbed wall partially hidden behind a tree on the right side of the picture. The road cutting on the same stretch leans on an inclined concrete retaining wall, which helps to support both the slope and a ramp*

Ill. 25: *A traditional stone wall works as a retaining wall for the road cutting, while the embankment has been successfully laid to grass so as to give it a natural feel*

Ill. 26: *The road platform is held by a retaining wall concealed under a finish of traditional stone walling. Traditional stone walling and an old-fashioned white parapet provide a good result in functional and landscape terms*

However, objects at road verges, that is, close to driving lanes, represent a problem in terms of traffic safety, so integration of the roadside areas must consider safety aspects carefully. Adjacent historic and cultural elements and vegetation must be adequately taken into account in road design and maintenance. Among these elements, rows of trees require special attention.

Measures such as traffic calming, special structural solutions (tunnels, bridges, lowered roads, barriers, etc.), landmark protection areas and grassy roadsides should be integrated as special elements in road design. Furthermore, roadside areas as zones of transition can be designed according to continuity criteria so that the road benefits from the character of the adjacent landscape.

Ills. 27 and 28: *(Left) Humilladeros (Comillas, Cantabria) are traditional countryside chapels on the verges of old roads in Spain. Cultural and natural heritage adjacent to roads is extensive. (Right) Local road and the old wall at San Giminiano (Italy), a safety area has been established between the road and the monument*

Ills. 29 and 30: *Road verges provide a sense of landscape to roads, their integration into road design must take safety standards into account. (Left) Traditional housing very close to the road's hard shoulder creates safety problems (reduces visibility, access problems to and from the road, etc.). (Right) An area off a side road creates a clean transition between pavement and landscape; it includes landscaping, a stone wall parapet and traditional cropped rounded walls*

Ill. 31: *Trees on a road verge in southern England. Their proximity to the road makes these rich landscape elements a safety risk (note the memorial on the tree trunk on the left side of picture)*

Trees on road verges present certain driving hazards, as does any obstacle very close to a road. The hazards are related to safety and frequently cause fatal accidents involving vehicles leaving the road. They also have a narrowing effect on lane width. Nevertheless, rows of trees on road verges are a very special and rich landscape resource. In most cases, they are a cultural product that is much appreciated by local communities, being a main feature of many cultural landscapes. They also have the benefit of bringing environmental cycles to the arid road landscape as well as providing protection from wind and sun. As they are dangerous obstacles for traffic, their preservation must be combined with speed control measures. Rows of trees must only be recommended for slow roads such as roads approaching urban centres, mixed-traffic pedestrian roads and other local roads.

Ills. 32 and 33: *Lines of trees on road verges. (Left) Road in the Pyrenees-Atlantic (France). Trees lining verges are considered a cultural asset, the preservation and maintenance of which are positively managed in France (photo by B. Uriarte). (Right) Chestnut trees at the side of a road at Ezcaray, La Rioja (Spain)*

Ills. 34 and 35: *Lines of trees on road verges. (Left) An allée of trees in the Cotswolds, England. Rows of trees filter sunlight and wind, and give a vertical sense to roads. (Right) A line of cypresses in Tuscany (Italy). Lines of cypresses are an internationally renowned Tuscan landscape feature*

Gardening and environmental recovery measures can be adopted in order to naturalise a road landscape. While gardening is more sophisticated and creative, usually involving exotic species, environmental recovery is aimed both at landscape and environmental purposes, such as preventing erosion. Environmental recovery measures include soil treatments, plantations and reafforestation. Urban road verges, traffic islands, roundabouts, and central reservations on motorways are areas suitable for gardening. Cuttings and embankment slopes, roadworks sites and decommissioned roads are typical areas for environmental recovery and reafforestation.

Ills. 36 and 37: *Gardening and environmental recovery in road design. (Left) Olive trees and ornamental plants on a gardened roundabout. (Right) Environmental recovery of an embankment slope (photo by E. Rico)*

In addition to regular road elements, other special elements and areas of roads have a specific role in creating a sense of identity. These are bridges, tunnels, roundabouts, rest areas, service stations, parking areas and bus stops. Each of these elements has special functional requirements and different landscape roles.

Road bridges have a strong presence, especially in landscape integration terms, that is, when viewed as part of the landscape. They also play a role in creating an identity for a road. They are very singular and must be dealt with specifically. Traditional bridges can provide a colourful character to roads, whereas modern structures can have a discreet effect with little effective presence or, on the contrary, they can have a spectacular character which imposes itself on the landscape.

Ills. 38, 39 and 40: *Bridges and road character. (Above) Simple arch bridge on the Segura River at Los Gallegos (Spain). The modern and simple structure has a modest presence. (Below, left) Stone bridge and parapets at a road in Montseny Nature Park, Catalonia. Consistency of materials and techniques gives a sense of road character. (Below, right) Spectacular bridge by Santiago Calatrava in Ondarroa, Biscay (Spain). Bridges can have an imposing presence, which is not always in keeping with the character of the landscape*

Ills. 41 and 42: *Mouths of two tunnels. (Left) Carved tunnel for a one-lane road on the island of El Hierro (Spain). (Right) Red ornamental protection marquee and plastered rocks at a tunnel in the Ricote Valley, Murcia (Spain) (photo by L. Cruz)*

Ills. 43 and 44: *Mouths of two more tunnels. (Left) Structure covered by stone wall on the island of La Palma (Spain) (photo by J.T. Rodríguez). (Right) Sophisticated ornamental walls for the Cantábrico Motorway (Spain). Note in both cases the slope of the hillside above the tunnel is partially integrated into the external design*

Tunnels hide roads underground, yet their entrances have a special role to play in road identity and character, and they have to deal with the special features of their surrounding areas. Here, the functional elements of roads and tunnels merge, with the resulting consequences of construction works (rock fall, landfills, previous working tracks and facilities, etc.) as well as with pure landscape elements such as rocks, vegetation, buildings and others.

Most tunnel mouth design solutions include support and protection structures. Small tunnels can show their carved rock uncovered. This gives a very powerful aspect to the landscape. Medium and large tunnels have to deal with rock collapses of the slope above the tunnel entrance, so they generally include either special treatments for the slope surface (extra cuttings, forced local collapses, special finishes, etc.), or protective structures of different sizes and shapes, or both. As in bridges, the exterior of these structures can be spectacular, functional, colourful and traditional, or just simple and discreet.

Petrol and service stations, together with rest and parking areas, are special areas in the sense that travellers get out of their vehicles and directly experience the landscape. However, these places have an irregular landscape profile since only exceptional landscape and road character are taken into account in their design. While rest area designs normally follow quite a sensitive approach to landscape and environment, petrol and service stations are basically oriented to serve the trademark identity.

Parking areas are generally functional with little or no reference to landscape or character features. Parking areas are strategic in providing adequate road access to quality landscape areas such as nature parks or historic urban centres without allowing cars to get into these sensitive areas. Their location must be discreet.

Bus stop design sometimes strongly reflects local features; at other times it adopts a functional and minimal approach. All these "stationary vehicle" areas have a special landscape potential which can be developed positively.

Ills. 45 and 46: *Parking area design. (Left) Stone walling and fruit trees at a parking area in Ibiza (Spain). (Right) Parking area at Oma, Biscay. Characterful elements such as trees and traditional stone walls have been integrated within the parking areas*

Ills. 47 and 48: *Bus stop design. (Left) Colourful and picturesque bus stop, Cantabria (Spain). (Right) Minimal and functional bus stop design in the Netherlands*

Ill. 49: *Homage to La Rioja wine tradition at the centre of a roundabout in Labastida (Spain)*

Finally, roundabouts must be pointed out as special character elements since frequently they adopt a clear identity by incorporating landscaping, monuments and other artistic elements. Very often they present the area's main cultural features, such as traditional industry and agriculture, art and history, traditions or celebrations. The motifs one can find on roundabouts are very varied.

3.3 Road elements for landscape enjoyment

Some roads include adjacent lanes that are specifically devised for people's enjoyment of the landscape, such as footpaths, bicycle lanes, scenic viewpoints and parking areas. These areas require a special planning approach since they have to combine landscape enjoyment with traffic functions.

Footpaths and bicycle lanes must be safe and comfortable. They are better suited to low-traffic roads and need to be separated from road traffic. A discreet separation can be efficient.

Ill. 50: *Separate bicycle lane. Safety barrier and low parapet separate pedestrians from traffic*

Ill. 51: *Footpath. A row of trees gives shade and protection from traffic*

Scenic viewpoints require a very specific location. The best landscape views are not always found in suitable places. There has to be at least enough space for safe access,

vehicle parking, standing areas or benches, information panels and waste disposal. The design of facilities must be adequate. Safety conditions must be guaranteed for vehicle access to the scenic viewpoint.


Ills. 52 and 53: *Scenic viewpoint. (Left) Parking lane and access. (Right) Parapets and barriers for pedestrian safety*


Ills. 54 and 55: *Scenic viewpoint information panels. (Left) Orientation panel at Setecidades volcanic lakes in San Miguel de Azores (Portugal). (Right) Panel displaying a map of Killarney National Park at a scenic viewpoint (Ireland)*



Ills. 56, 57 and 58: *Scenic viewpoint facilities design. (Left) Stone parapets, stairs, walkways and look-out areas at different levels leading to an observation point. (Centre) Rusted steel, white parapets and lava rocks make up this scenic viewpoint facility. (Right) White clay and sand walls, stairs and arch frame the view*

3.4 Landscape approach to road design

For an approach to road design based on considerations of landscape each of its aspects must be considered together with traffic safety and comfort, and respect for the environment and landscape within a comprehensive approach, so that the selection criteria regarding the character, identity and landscape facilities of the road, and its integration into the landscape, should produce high-quality infrastructure that benefits from landscape resources without compromising on safety and sustainability.

In this sense, road design must avoid damaging landscape features and should instead integrate them harmoniously. Traditional structures, such as walls, agricultural infrastructure, milestones, architecture, etc., as well as vegetation, such as individual trees, tree groves, hedges, lawns and others, should be respected and incorporated in the landscape of the road.

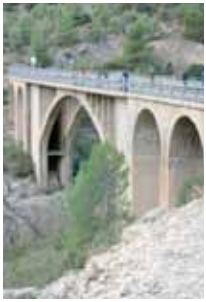
Ill. 59: *Typical stone walling and chestnut trees at road margins are features of the Cotswolds' landscape. These can be easily and discreetly integrated into road design*

Ills. 60, 61 and 62: *Sandstone is a consistent material which, when used in different roadside elements (retaining wall, drains and parapets), builds up a sense of identity*

A consistent approach to the design criteria of special elements is also recommended so that identity and character can be reinforced. The consistent use of the same design criteria (type of stone, barriers, signposting, etc.) gives a sense of unity to road space.

This is good for both infrastructure identity and traffic safety. Consistency helps the driver to understand the role of each element within the road system.

Ill. 63: *The parapet in the foreground is a traditional stone wall that is integrated with modern materials, such as the safety bollards. In the background a retaining wall is covered with traditional black stone, while at either end there are local plants and trees and large rocks as well. All these elements together manage to create a sense of identity for the road*



Ills. 64, 65 and 66: *The consistency among three different road bridges in the mountains of Alcaraz and Segura (Spain) – they all share similar arched structures – gives the road a uniform identity*

Ill. 67: *The linear character of roads determines their role in the landscape. The visual presence of roads and their effects on perception of the landscape are based mainly on their linearity*

4. Road integration within landscape

4.1 The role of roads within landscape

Roads are special elements within the landscape and they should be treated as such. They have a specific role which is mainly related to their linear character. Volume of traffic, earthworks and their functionality are special features that determine their impact on landscape.

First, roads have certain specific short and long-term environmental effects that must be taken into account if landscape preservation is desired.

Second, from a scenic viewpoint, roads have a dual character since they can be considered as windows moving across the landscape as well as part of the scene. Roads run along the landscape taking part in different sights and landscape views.

Ills. 68 and 69: *Roads on the slope and at the bottom of a valley in the Serra de Agua, Madeira, Portugal. A variety of environmental effects of roads should be taken into account. (Left) Short-term effects: water aquifer reserves can be drained by the effect of road cutting at the base of the aquifer formation. (Right) Roads are an axis for human activity that must be taken into account in strategic planning*

Third, they are linear, continuous and geometric elements the aspects of which often contrast with the generally organic features and elements of landscape.

Fourth, their functional aspects, particularly those of some of their special elements (such as bridges, road markings, safety barriers, signposting, etc.), bring functional meanings to the perception of traditional and natural landscapes.

4.2 Environmental effects of roads

The environmental effects of roads can be grouped into the following:

- destruction of environmental resources;
- barrier effect of roads;
- the effects of traffic on noise, air and water pollution and safety;
- long-term effects on development and conservation patterns.

Destruction of environmental resources such as soil, flora and fauna, cultural and community assets, etc., takes place during construction along the edges of the land that is occupied by the road and its earthworks. The alignment of new roads must be defined carefully, particularly those of roads which have wide sections or require much earthwork, or those that cross rich or fragile areas. Similarly, upgrading of existing roads, such as to cater for increased capacity or straightening, must avoid, or at least minimise, these irreversible effects on environmental resources. In addition to environmental impact assessments, which are always advisable, road planning and design criteria must also be integrated positively into the prevention and reduction of negative environmental effects.

Ill. 70: *The effects of road barriers are varied. Road embankments affect tide cycles and therefore inland wetlands biodiversity in this estuary of La Rabia, Cantabria (Spain)*

The effects of roads as barriers affect different environmental processes. There is a severance of community links, habitat fragmentation and run-off disturbance. Context-sensitive design, and definition of alignment and transversal sections (including special solutions for tunnels, bridges and cut-and-cover tunnels) must prevent these effects. Sensitive areas (urban and dispersed housing areas, nature areas, flood and river plains, etc.) should be avoided. New roads in sensitive areas such as these must incorporate special permeability elements (see COST 341 – "European handbook on habitat fragmentation due to linear transportation infrastructure"). For existing roads, habitat defragmentation, community severance recovery and hydrological restoration of rivers affected by roads should be included as part of road planning schemes.

The effects of traffic on noise, air and water pollution vary according to the composition, intensity, speed and driving styles of road users. Some areas, such as urban areas (particularly housing areas), nature areas (fragile forests) and quality water bodies (reservoirs, wetlands, etc.) are especially sensitive to exposure to noise, pollutants and traffic hazards. All these should be taken into account when planning new roads and upgrading existing road networks.

Finally, the long-term effects on development and conservation should be taken into account in road management schemes, especially when high-capacity roads (such as motorways) are involved. Roads cause deep structural transformations, such as economic, demographic and social changes of different types, as well as increasing pressure on fragile nature areas and the consequent environmental degradation. Among the former, improvements in access brought about by roads encourage long-term urban sprawl, abandonment of agricultural land, industrial decentralisation, enlargement of trading centres' catchment areas, second residence areas, social deprivation of adjacent areas, etc. Among the latter are the increase of human activities in fragile nature areas, together with major land and housing developments in protected zones. A strategic view of road management schemes should include the prevention of these long-term effects.

Ills. 71 and 72: *Roads not only offer views of the landscape, they are also part of it. (Left) The coast road that offers impressive views of Dubrovnik (Croatia) shows itself on the slope. (Right) The road leading to this view of a limestone cliff in Malta is enclosed on either side by a wall*

4.3 The road into the landscape

Roads run across a landscape offering views and also taking part in the scenery. In addition to the environmental effects of roads, which transform landscape processes, there are also effects on landscape perception.

In the first place, this scenic effect depends on how road alignment relates to landscape patterns. Morphology, rivers, fields, vegetation, as well as buildings, form landscape patterns. Some roads are aligned on landscape patterns, whereas others cross them. While it can be said that the former contributes to the harmony of landscape composition (that is, it is compatible), the latter causes a sense of disruption which, in some cases, can damage landscape value.

When road elements are discreet and compatible, the road's linear character can have a positive effect on landscape perception. A road's alignment gives a sense of depth to scenes which would be perceived as flatter without such a road. Alignment linearity and continuity mark irregular geo-morphologies providing a reliable reference on relief variations. Regularity of functional elements, such as safety barriers and road markings, contribute to this sense of depth and relief.

Ill. 73: *The road runs at the base of the slope in this narrow valley of the River Jucar (Albacete, Spain). Road presence can be discreet and unimposing when its size and alignment follow basic landscape patterns*

However, road alignment requires earthworks such as cuttings and embankments. These can become something of an eyesore when road speed and capacities need to be high (which implies soft ramps, open bends and wide sections) and morphology is adverse. Additionally, roads include bridges and tunnels when they need to go across deep ravines or through high mountains. When these road elements are large, they can have an imposing effect on landscapes. They produce contrasts in scale and introduce new shapes into landscape morphology. Adjusting the alignment of new roads minimises these effects. Road upgrading can greatly enlarge cuttings and embankments. Environmental recovery of earthwork slopes and adjacent areas, together with landscaping at traffic islands and roundabouts, can reduce the artificial aspect of earthworks.

Ills. 74 and 75: *The linear effect of a road can emphasise landscape composition by giving a sense of depth. (Left) The alignment of a small road shows off the morphology by providing a continuous reference to the observer along the hills. (Right) Linear presence of roads, reinforced by "teeth-like" parapets, gives a sense of depth and real relief*

Ill. 76: *Construction of a separated dual carriageway to expand capacity. Earthworks, particularly those of high-speed and high-capacity roads, determine road presence in the landscape. Road infrastructure involves a variety of elements, such as separate lanes (1 and 2), embankments (4 and 5), cuttings (3), service side road (7), and building installation areas (6)*

Ill. 77: *Slope cutting of roads produces a "scar effect" on the landscape, which can only be partially reversed when the slope allows through revegetation measures and rock treatments*

Ill. 78: *Stone walls as retaining walls have a positive effect on landscape*

Cuttings have a strong landscape effect since they expose bare rock material. Slope cuttings can have a "scar effect" when the slope is not adequately treated. Embankments are normally more discreet since they are not steep.

Ill. 79: *Cypresses on an old path, Tuscany, Italy. Roads, tracks and paths, and their formal elements play a positive role in landscape character*

When embankments or cuttings are replaced by retaining stone walls, the road's integration into the landscape is more effective.

The special character of elements, such as rows of trees, bridges, traditional safety barriers, stone walls, milestones, etc., greatly enhances the landscape. They provide cultural keys to landscape perception.

Road bridges have a very distinctive presence in a landscape, not only because of their special characteristics, but also because of their scenic value and location.

Bridges span rivers or ravines and thus frame the landscape. Despite their primary function of providing support, there are light elements in bridges, such as pillars, arches or suspension cables, which lend a airy aspect.

The landscape properties of all these road elements, such as alignment, standard items (safety barriers, road markings, etc.), embankments, cuttings, retaining walls, bridges and others should be taken into account in road management schemes and plans.

Landscape management schemes must include a consideration of the role of roads in the landscape and how this varies according to their alignment and special elements.

Ill. 80: *Traditional character elements, such as a teeth-like safety barrier and retaining walls made from local stone, encourage positive landscape integration*

Ill. 81: *Road bridges have a powerful effect on landscape, which can be spectacular or discreet, the latter being the case of this stone bridge on the River Avon (England)*

Ill. 82: *The bridge at Mostar (Bosnia and Herzegovina), built in 1566, destroyed in 1993 and restored in 2003. Infrastructures are not merely functional artefacts, they often possess special cultural and social meanings*

Conclusions: landscape values on every road

Landscape values

Landscape values which have been reviewed in the previous paragraphs are not exclusive to protected areas, or to very special roads. On the contrary, all roads enjoy these positive landscape features. This is so because all roads are part of territories which are perceived as valuable landscapes. Landscape values are shared by all roads to a greater or lesser degree.

Commuters have a better knowledge of traffic and road characteristics. They have a self-confident attitude towards driving. This somehow liberates their attention to take in the landscape which has a special familiar feel. The environs of roads used by commuters are seen as just other collective social areas where community life takes place. These drivers dislike landscape degradation, being very demanding on quality standards in these areas. Landscape quality is not exclusive to countryside roads in pristine landscapes; roads serving routine movements must also assume a positive landscape profile.

All roads provide access to places and landscapes of varying degrees of interest. Some take us between home and work every day. Others allow us to explore our regions and countries. They also facilitate our trips to new and different places, allowing us to enjoy their distinctive culture, nature and landscape.

All roads have scenic qualities in so far as they provide itineraries through different scenes and views. Road management schemes must consider the scenic quality of all roads and not just those in areas of outstanding landscape. Any road through

any landscape has some sort of scenic quality, that is, it has a certain potential to show off a landscape. Although not always noticeable, roads follow itineraries that are related to the nature and history of the land they cross. Thus, any road through any landscape enjoys different landscape values, such as cultural and natural aspects of its own itinerary, some sort of scenic quality and a certain character of its own.

In relation to identity and character, it is true that functional elements, safety standards, advertising and trademark images are always present and very much to the fore in roadside scenery, yet these are not the only available clues. Road environs always enjoy a certain sense of identity – often hideous and in some cases conspicuous – supported by an array of subtle clues. These give us a sense of place which frequently lies beneath the instantly perceptible.

Many roads include facilities for the enjoyment of landscape other than from within the vehicle. There are footpaths, scenic viewpoints, or just parking areas to leave our vehicles and start walking into the landscape. When roads do not enjoy these specific facilities, they can be envisaged, particularly if the resources are available and the goals of any spatial planning project are properly defined and implemented.

Finally, roads enjoy a certain degree of landscape integration in terms of the environmental processes they disrupt and in relation to their role as elements of landscape perception and enjoyment.

Road policies and management, and landscape values

All these road features are positive in themselves. If adequately managed they can create a sense of landscape in addition to the functional benefits of the circulation of traffic. Landscape is a unique cultural and natural heritage which often appears disguised, misperceived and, thus, degraded, if it is not positively adopted by planning policies. Road management schemes are crucial in this sense. Inversely, the relationship between road travel and the landscape is rich and fruitful for landscape awareness and perception; it must therefore be adopted by those responsible for the landscape. The promotion of road landscape features should not be restricted to special landscape areas. If positively adopted, access, scenic qualities, character and the other landscape values of roads can be greatly enhanced by road planning, management and design.

Therefore, road landscape values should be considered in any road management scheme. According to the spirit of the European Landscape Convention, schemes for management and planning of road networks must integrate the scenic value of roads (as well as other landscape values) as a cultural resource. Values such as visual capacity, identity, and natural and cultural aspects of the route can be enhanced through specific measures within an adequate and sensitive process for planning and design.

Appendix 1 – Landscape management and road planning

Ill. I-1: *Los Geneveses Bay is a sandy bay within the Cabo de Gata Natural Park, Almeria, Spain*

The Cabo de Gata Natural Park is located in the south-east of the Iberian Peninsula. There are chains of volcanic mountains which approach the Mediterranean Sea, leaving little sandy bays in between. It is a hot, dry environment, the harsh climate conditions of which encourage rare flora and fauna, including numerous endemic species. The shallow waters are home to extensive and rich posidonia seaweed forests. Old fortresses and small fishing villages are scattered along the coast. Historically, this underdeveloped area has suffered from inland isolation and remoteness, the sea being a better connection to outside influences. Exhausted gold mines and very poor agriculture were not able to develop the area during most of the 20th century. Lack of development preserved the natural features of its landscape. The end of the 20th century saw the rapid development of tourism in the south-eastern coast of Spain. Tourist resort developments on the coastal fringe, together with the expansion of greenhouse-intensive agriculture, threaten the landscape values of this area. Currently, the development pressure, which has transformed most of the western Mediterranean coast, is restricted here to certain areas. However, tourist demand in the area is a pressure on this landscape.

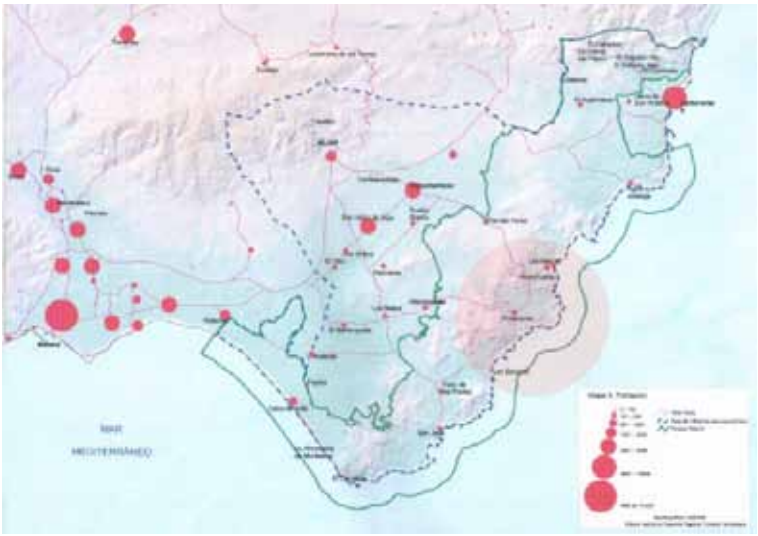
The role of road accessibility, particularly access to beaches and the coast, is crucial in determining development potential. Some tracks are kept unpaved and rough as part of the park's management policy.

Ill. I-2: *Volcanic mountains and cliffs by the sea at Monsul Beach create a well-preserved wild beach and a pristine landscape*

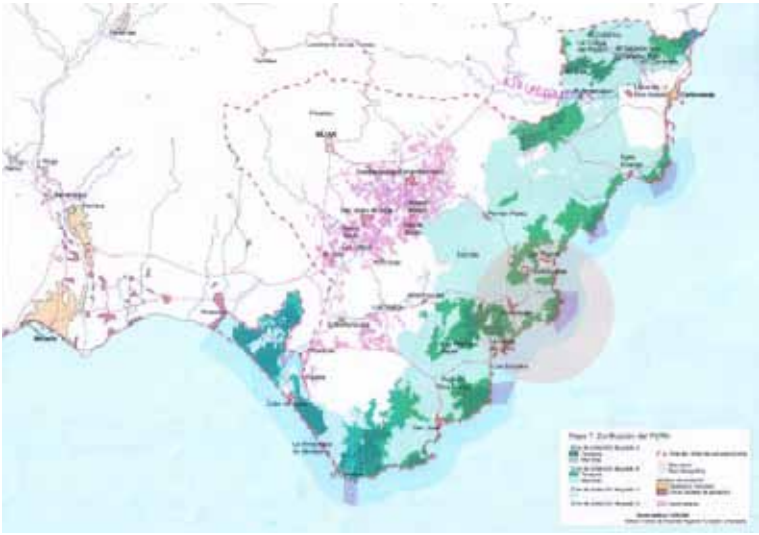
Ill. I-3: *Rare psammophile and halophile (foreground) survive alongside tourist activity at the beach in Los Geneveses Bay*

Ill. I-4: *The traditional fishing village of Isleta del Moro, currently a modest tourist centre*

Ill. I-5: *17th-century fortress at Rodalquilar Bay*



Ill. I-6: *Population settlements and roads around the Cabo de Gata Natural Park. The dark circle shows the area photographed (graphic by L. Donada)*



Ill. I-7: *Cabo de Gata Natural Park's Natural Resource Management Scheme. The grey dotted line is the park's boundary; blue areas are posidonia fields; the dark green areas are zones strictly protected; and pink areas are greenhouse cultivation. Note the road network and its relation to preserved areas. The dark circle shows the area photographed (graphic by L. Donada)*

Ill. I-8: *The landscape of Monsul includes unique resources such as a huge sand dune, palm bushes (*Chamaerops humilis*) and an agave tree on the beach. A sandy track (right) provides access to the beach*

Ill. I-9: *A track leads down from the arid hill towards the bay of Los Geneveses*

Ill. I-10: *Narrow roads at Isleta del Moro. Note groves of palms and pines*

Ill. I-11: *A fully-equipped road crosses Rodalquilar Valley. It provides a connection from south to north through all the main nuclei in the park*

Appendix 2 – Landscape, ecology, art and history of a road itinerary

Ill. II-1: *A view of the upper part of the Rubagón River Valley (Palencia, Spain). The Castilian plateau extends in the background to the left. To the right of the picture, the Natural Park of Fuentes Carrionas*

The Rubagón River Valley traces the limits of the Old Castile, in the province of Palencia (Spain). From a height of 1 000 metres at its head, the valley opens as it descends gently from north to south. The mountains at the upper and western part of the valley form a natural barrier between the central plateau and the Atlantic valleys. Geographically, the Rubagón River Valley is a place of transition between the Mediterranean and the Atlantic systems. The Natural Park of Fuentes Carrionas has extensive mountain forests of Mediterranean oak, where the influence of the Atlantic climate can be felt. Throughout history, the Rubagón River itself has served as a main communication axis. Roman Empire communications systems in northern Spain included a main road to the north, parallel to the Rubagón River, and another across the river, to Cantabria in the north-east.

Later, after the Muslim invasion, Christian colonisation of the plateau started in this valley. The original settlement system, which was established by Christian settlers during the 10th and 11th centuries, has been preserved to the present day. As a result, a rich set of Romanesque hermitages are scattered around the valley. Hermitages are also historic evidence of the north-to-south settlement process, since they were built when sufficient resources were available, that is, when the new community was deeply established on the land. Though housing and nuclei evolved, the settlement distribution was maintained because the local economy was based primarily on agriculture and hunting.

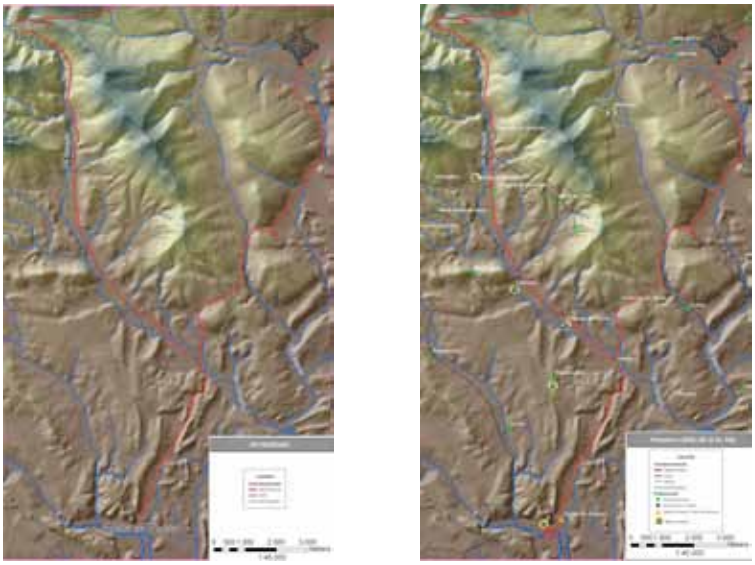
It was not until the beginning of the 20th century, with the start of coal mining, that the expansion of some settlements in the north of the valley occurred and some new ones appeared in the east. However, the Rubagón River still functioned as the main

communication axis when a new railway line for coal transport ran parallel to the river. A landscape of industrialisation took over until mines were exhausted and pits closed in the last century. At present, the unique and varied collection of Romanesque hermitages, and the natural areas in Fuentes Carrionas attract cultural tourism, which still follows the Rubagón River as its main communication axis. The current P-220 road gave rise to this very rich geographical, ecological, artistic and historical itinerary.

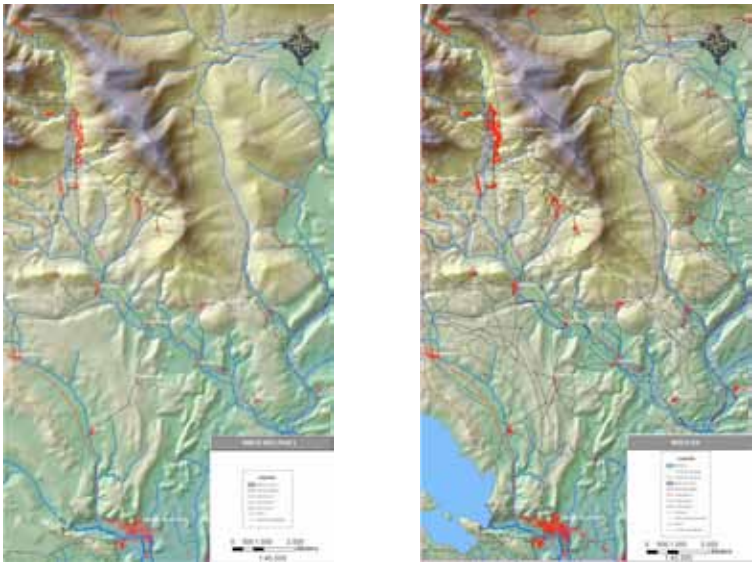
Ill. II-2: *Oak tree (*Quercus pyrenaica*) forest in the Rubagón Valley shows the transition between Mediterranean and Atlantic ecological systems*

Ill. II-3: *Stone bridge of Roman origin on the Rubagón River at Nestar. The Roman road to the north-east and the present-day P-220 road run parallel to the river to the left of this picture. The Roman road to Cantabria split off here*

Ill. II-4: *The P-220 road passing by Villavega de Aguilar, where new housing stands near the parish church and cemetery (a listed monument)*



Ills. II-5 and II-6: *(Left) Main roads in the Roman period. (Right) Christian colonisation settlements, 9th and 10th centuries (maps by J. García-Villar)*



Ills. II-7 and II-8: *(Left) Mining settlements at the beginning of the 20th century. (Right) New developments in the 20th century: reservoir (1950s), motorways (1990s) and windmills (2000s) (maps by J. García-Villar)*

Ills. II-9 and II-10: *(Left) Archaeological research works at Santa María La Real in Cillamayor. (Right) San Cipriano and San Cornelio in Revilla de Santullan, two impressive Romanesque churches in the Rubagón Valley*

Ill. II-11: *Old mansion house in Santa María de la Nava*

Ill. II-12: *Miners' housing at the verge of the railway and the P-220 road. Note mining waste being restored in the background*

Ills. II-13 and II-14: *(Left) Upper part of the Rubagón Valley where mining waste is being restored. (Right) Bus stop and traffic signs on the P-220 road in Villavega de Aguilar*

Appendix 3 – Road alignment and integration in the landscape

Ill. III-1: *The A-3002 road in Álava (Spain) offers views of good quality scenery. It has been upgraded to include landscape facilities such as a bicycle lane and a footpath*

The A-3002 connects the town of Vitoria-Gasteiz, in Álava (Spain), to the recreational area of Ulibarri-Gamboa, some 12 kilometres north. This road starts in the northern suburbs of Vitoria-Gasteiz, shortly afterwards crosses the A-1 ring road motorway, and then runs north along the Álava plains and the villages of Durana and Arroiabe to reach the shores of the Ulibarri-Gamboa reservoir. This area, situated at the bottom of the Aitzkorri mountains, is very popular. Its landscape is very much appreciated.

The road has a high scenic quality. It goes north along the plains by the River Zadorra until it reaches the concrete dam. The road then runs around the reservoir between the mountain slope and the water shore. The road was built using cuttings on the former and embankments on the latter. Despite little room being available, its section was later extended and diversified to include a bicycle lane in the plains and a footpath around the reservoir.

A platform was built along the side to hold the footpath without damaging shore vegetation. This vegetation has a strategic role since it supports ecological connectivity underneath the road. A safety barrier and a low parapet separate pedestrians from traffic. A guardrail prevents access to the shore. In addition, traffic calming measures such as rumble strips were adopted.

Ill. III-2: *A conventional bridge allows the A-3002 to cross the A-1 ring road motorway. Note urban graffiti on the walls*

Ill. III-3: *The road follows an old way and passes through two villages, Durana and Arroiabe. Traditional stone walling and old housing very close to the road's hard shoulder give character. Speed reduction is applied here for safety*

Ill. III-4: *The Ulibarri-Gamboa dam seen from the A-3002 road*

Ill. III-5 and Ill. III-6: *(Left) Picturesque bus stop. (Right) Recreational activities by the reservoir; parking and access from the A-3002 road*

Ill. III-7: *A view of Ulibarri-Gamboa from the A-3002 road*

Ill. III-8: *Construction of a side platform has enabled a footpath to be built adjacent to the A-3002. A white parapet and a safety barrier separate pedestrians from traffic and a guardrail prevents access to the shore*

Ill. III-9: *Cuttings and embankments alternate together with short bridges on the small ravines, which allow habitats access to the reservoir shores*

Ill. III-10: *The side platform (on the left) respects vegetation on both sides of the road, encouraging ecological connectivity*

Ill. III-11: *Speed reduction marks on the road and a low safety barrier create more footpath safety and comfort*

Ill. III-12: *The A-3002 follows a scenic itinerary around the reservoir*

Appendix 4 – A road for the enjoyment of landscape

Ill. IV-1: *A view of Lekeitio from the road to Karraspio on the opposite side of the mouth of the River Lea: the beach of Isuntza (left) and the fishing harbour (right). In the foreground, a tide dam runs across the picture*

Lekeitio is a fishing town on the coast of Biscay (northern Spain). The nearby beach of Karraspio is connected to Lekeitio by a road which starts on the other side of the mouth of the River Lea. This road runs around a cliff – half cut into its vertical slope and half on a flying platform – and finally descends down to the beach of Karraspio. This beach is covered completely at high tide. The alignment of the road on the opposite side of the mouth of the Lea allows for a beautiful panorama of Lekeitio fishing port, the surrounding traditional housing, the central town park, the beach of Isuntza, the Lea River mouth and the small rocky island of Saint Nikolas right on Karraspio beach.

The road is in fact a cul-de-sac which ends at the beach. It has little traffic, which is only seasonal. In addition to conventional use by traffic, the road has an important social use as an attractive landscape walkway. Some road facilities allow for this enjoyment of landscape. There is a footpath which runs along its full length. It is separated from traffic by a low parapet decorated with some gardens. A series of lights stands on the parapet, reinforcing the separation effect. An unpretentious railing protects people from falling from the outer side of the walk onto the beach at high tide.

The narrow space cut into the slope for the road has been extended by a side platform, which allows for two traffic lanes, the pedestrian walkway and two scenic viewpoints. Near the river mouth, where the road starts, there is a rest area with some shady trees (*Acer pseudoplatanus*) and a couple of benches.

At the round corner of the cliff, there is another scenic viewpoint which has been built on the flying platform. This belvedere at the corner has a privileged location because it allows people to look out at Lekeitio to the west, the island of Saint Nikolas

to the north and Karraspio beach to the east. Finally, the road and its footpath reach Karraspio beach. Here, some panels explain the character of this beach. There are stairs that descend to the beach from the footpath.

Ill. IV-2: *A view from the road to Karraspio shows the fishing harbour and historic centre of Lekeitio, and the open sea on the right. In the foreground is the tide mill dam*

Ill. IV-3: *Saint Nikolas Island and the beach of Karraspio as seen from the road. The tide dam runs from the island to the left*

Ills. IV-4 and IV-5: *(Left) The Karraspio road cuts into the rocky slope. The cuttings of the main road to Ondarroa are noticeable above. Note the flying platform on the left. Sea is at high tide. (Right) The dam for the tide mill shows its alignment from Saint Nikolas Island to the river mouth at low tide. Note, on the right of the picture, the flying platform of the road to Karraspio*


Ills. IV-6 and IV-7: *(Left) Bridge over the River Lea. (Right) The beginning of the road to Karraspio includes a small rest area with shady trees and some benches*


Ills. IV-8 and IV-9: *(Left) Santa María church in Lekeitio as seen from the side walk. (Right) A view of the mouth of the River Lea at low tide*


Ills. IV-10 and IV-11: **(***Left) Footpath separated from traffic lanes by a white parapet, including top landscaping and lights. (Right) The footpath around the road bend includes a scenic viewpoint*


Ills. IV-12 and IV-13: *(Left) Double-sided benches and a litter bin. (Right) The beach and the island of Saint Nikolas can be seen through the railing*


Ills. IV-14 and IV-15: *(Left) Side platform on the rocks. (Right) Stairs down to the beach*


Ills. IV-16 and IV-17: *(Left) Footpath by the beach, in the background Lekeitio. (Right) A panel explains Karraspio beach features*

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