GOOD PRACTICES FOR THE LANDSCAPE INTEGRATION IN PR

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1. SCOPE AND OBJECTIVES OF THIS MANUAL

The aim of this manual (García Sánchez-Colomer *et al*. 2018) is to support the protection of landscape in the environmental impact assessment of projects. More specifically, the objective is to provide the promoting company, and the environmental and developer administrations, with sets of mitigation measures for visual impacts, grouped by kinds of projects.

For this, we have extracted, reorganized and eventually modified original recommendations that come from Spanish guides of good practices for the integration of projects in the landscape. We have also added some original recommendations. In total, more than 600 recommendations are collected in the monograph.

The guides consulted in the bibliography are developed with different objectives, methods and scopes and even different languages. Some guides deal with a single typology of projects (e.g. roads, railways, power lines, wind farms, urban gardens, land consolidation, industrial estates, coastal aquaculture facilities and houses in rural areas). Other guides are developed in a variety of cases of different types (rehabilitation of a farm, riding facilities, special urban plan for a camp, demolition and construction waste treatment plant, photovoltaic solar park, wind farm, poultry farm, winery and urban plan in a coastal area). Finally, some guides propose recommendations for a variety of actions in very sensitive ecosystems (rivers and beaches).

These recommendations should not be interpreted as universal rules. Each project will have its peculiar circumstances and its own landscape expression.

2. VISUAL ADAPTATION *VS*. LANDSCAPE INTEGRATION

We have emphasized differences between “visual adaptation” and “landscape integration”. Both can be often confused but they have very different consequences. Visual adaptation has an ornamental character, its goal is an aesthetic quality. For example, when designing a

fluvial work, we can use allochthones species and hard materials, guided mainly by chromatic characteristics and economic costs. However, this manual is intended landscape integration, beyond decorative attributes. The landscape integration must be based on functional features, mainly techniques, species and designs, on an ecological framework.

3. SCOPE AND STRUCTURE OF THE MANUAL

This manual proposes recommendations for the landscape integration of only a few project groups (projects in rivers, constructions on the coast, mining opencast, wind farm and roads and railways) (Figure 1). In a later chapter, recommendations are proposed for a set of auxiliary services that are common to any project, such as access, parking lots, lighting, walls and perimeter fences, perimeter locations and information panels. Finally, a third chapter includes the recommendations aimed at integrating projects conditioned by the main structuring elements of the landscape (territory, relief, perimeters, visibility, composing and textures).

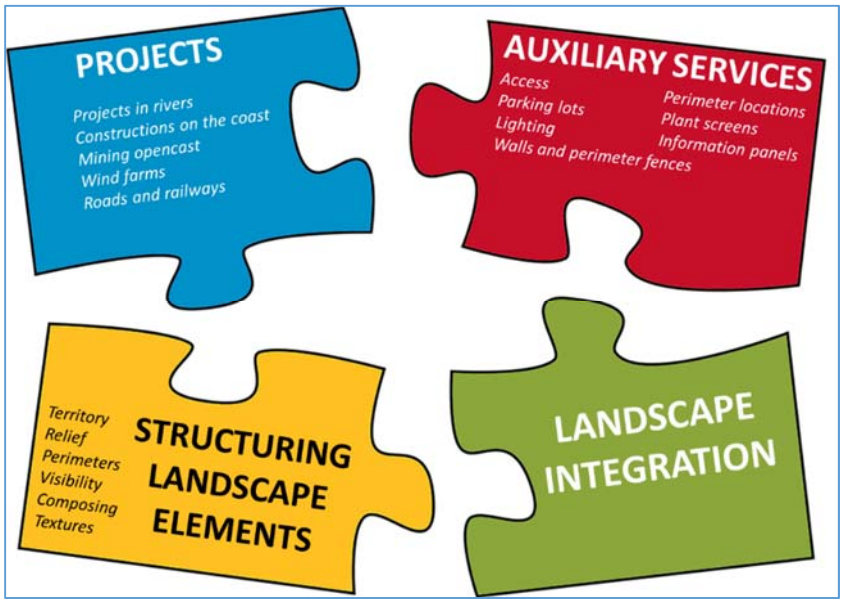

Figure 1.- Structure of this manual

4. STRATEGIES FOR LANDSCAPE INTEGRATION

The main objective of landscape integration studies is joining the natural character of the place (e.g. agricultural, coastal, mountainous, historical-heritage) with the artificial elements of the new project that is to be built. Therefore, a landscape integration strategy must be established before proposing integration measures.

This integration strategy depends mainly on the characteristics of the project itself (if its territorial impact is punctual, extensive, linear, dispersed, its size, etc.) and the characteristics of the environment (if it is located in a very exposed topographic position or in proximity to

population centers, infrastructures, etc., or in less visible areas). Normally, an appropriate combination of both characteristics (project and area) helps to establish the most recommended landscape integration strategy.

We can establish a hierarchy of landscape integration, from naturalization, fusion, concealment, mimicry to singularity. The optimal strategy is naturalization and the singularization is the least desirable. There are other intermediate strategies.

Normally the biggest problems occur in structures in larger projects or located at higher altitudes. The problem increases when both characteristics coincide. This is the case of wind farms located on mountain range.

A project can follow different strategies according to the topographic location. In this way, in a hilly area, in a valley or behind a forest mass, we can try to hide even large infrastructures, such as highways and high-speed lines, quarries and mines, industrial warehouses, solar parks, etc., while that the same project can be quite visible on the slopes of a mountain if they are oriented to urban centers or infrastructures that concentrate a large number of users.

Therefore, each project must adopt its own landscape integration strategy, between hiding and displaying. This idea is expressed in figure 2.

The main objective of hiding is to avoid perceiving the technification of the landscape. On the other hand, when projects are very visible, our better strategy is the ordering of their elements.

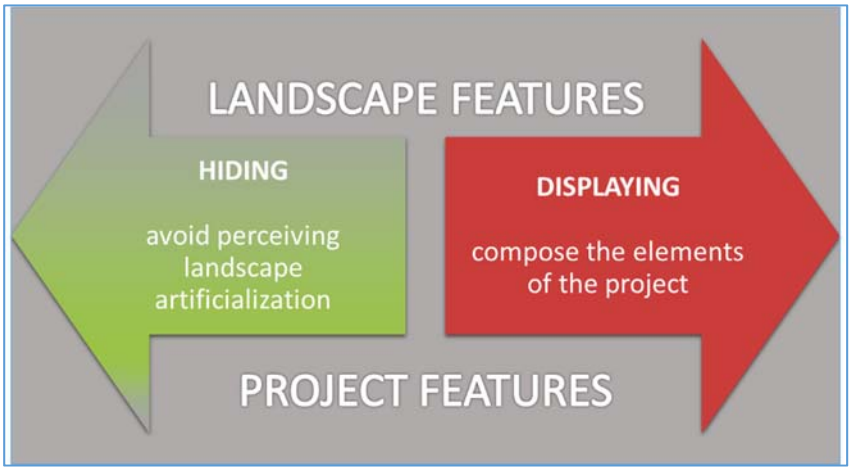

Figure 2.- Strategies for an adequate landscape integration

There is another more commonly used strategy that consists of highlighting certain elements to make them more visible. For example, to reduce the risk of bird collisions with power lines

installing springs or loops, it is also common to install black silhouettes on transparent screens or white metal foils on fences.

5. APPLICATIONS OF THE STRATEGIES TO SPECIFIC CASES

A. Highlighting

Sometimes, there are projects or elements of projects in which the strategy is to make them very visible. For example, to avoid the collision of birds with the cables of an overhead power line, we have to make them visible with specific devices: ties, springs, etc. Other cases of highlighting are the fences in railways or roads, with white sheets.

B. Naturalization

The strategy that we all value as optimal is the naturalization of the project. Through this strategy we turn the project into an element of the landscape. Aquatic habitats provide an excellent framework to achieve our objectives. We can use this strategy for restauration of a gravel pit or a small open pit mine.

C. Fusion

The next step between our integration strategies is fusion. The whole project cannot be part of landscape, but the correct treatment of some elements of the project or the use of soft materials (such as wood) reduces the impact of the whole on the landscape.

We can use this strategy for projects in aquatic habitats. These kind of projects often include activities that promote their scenic enjoyment, so we must equip them with the necessary facilities so that the experience should be satisfactory (dry paths, minimal treatment to contain vegetation, information panels, etc.).

Also the revegetation of highways and railways slopes facilitates landscape integration and the use of crossing structures by fauna.

D. Hiding strategy

The next approaching strategy is "hiding" the project. Sometimes we can hide our project by placing it far from any view, for example at the bottom of a valley or on a plateau, but it is not always possible. In this approach, for example, we can move industrial facilities away from the roads.

E. Mimicry

Another strategy is mimicry. In general, we will need many years to achieve it, because native trees and shrubs grow slowly.

It would be the case of the slag heaps with rounded edges and covered with topsoil, in order to integrate them into the landscape.

F. Displaying

The most difficult strategy for project integration is visualization. Sometimes, when we cannot develop naturalization strategy, fusion, hiding or mimicry, due to the dimensions or the topographic position. Another strategy can be adopted: order the elements.

In these cases, to reduce the impact on the landscape we have to order its parts. The most striking elements should be placed behind the main structure, and the main elements should be placed in a predictable, regular, legible manner.

For example, wind turbines in rounded landscapes, should be grouped regularly. The elements that serve as reference of the scale should be avoided.

Also, acoustic screens improve the visual quality of a road using a color code, according to the colors that surround it.

6. GENERAL RULES ABOUT THE IMPACT OF VERTICAL STRUCTURES

Two general rules on the visual impact of vertical structures can be considered, both are closely related.

1st.- When composing the elements of a project, human eye perceives more the vertical dimensions than the horizontal ones, for example a water tank in a flat area.

2nd- Introducing a visible artificial element into a landscape, it becomes the focal point, attracting all attention.

This effect occurs, for example, if we install a turbine in a high point of the landscape. It produces a visual attraction, hiding other elements of the landscape.

5. SOME RECOMMENDATIONS FOR THE LANDSCAPE INTEGRATION IN RAILWAY PROJECTS

A review carried out through the ICEX Spain Export and Investment (https://www.icex.es/icex/es/navegacion-principal/todos-nuestros-servicios/informacion-de-

mercados/paises/navegacion-principal/noticias/NEW2017712945.html?idPais=AU#), of the forecasts of the main development activity in Australia, highlights among other important projects the construction of a railway line between Brisbane and Melbourne (called Inland Rail).

The following recommendations are extracted from the handbook. These specific recommendations can be used for railway lines and linear transport infrastructures in general.

A. General recommendations

1. Use of native plant species for the environmental recovery of degraded areas due to the works on slopes and other elements of the railway. Plant vegetation coherent with the existing landscape.

2. Raise appropriate objectives of landscape integration through vegetation. Use the characteristics of the vegetation as a project tool.

3. Use of meaningful components is recommended, such as hedges at the bottom of the slope or small terraces lined with stone that allow plantings.

4. Simple and uniform design of linear components: containment modules (for example parapets and safety barriers), pavements, drainage elements and acoustic screens.

5. Constructive designs of the singular elements coherent along the track (for example, overpasses).

6. Regularity and simplicity contribute to the legibility of structures with great visual impact, such as bridges and viaducts.

7. Use of plants or stone coverings around the pillars of bridges, culverts and underpasses softens their rigidity.

8. Exposed rock and masonry walls give them a high landscape value. Other very functional options are shotcrete and engineering structures with pure geometries, but they need landscape integration treatments.

B. Landscape integration of slopes

1. Slope and embankment revegetation on loose materials is recommended to ensure their stabilization and landscape integration avoiding erosion processes. Native species with low

water requirements should be used. Exotic plants should never be used because irrigation, fertilizers and other care can contribute to their expansion for years.

2. On steep slopes (greater than 3H: 2V) it is recommended to use fastening systems such as jute plant, sisal fibers or other vegetable fiber-screens, metal nets or other similar. Topsoil is extended over these materials.

3. Gravity walls or concrete screens (for fastening slopes, abutments or embankments) can be covered with stone walls simulating masonry walls.

4. With lower height slopes we can build stone walls or terraces that compensate the pressure of the slope.

5. Stone-covered walls adapt very well to different elements such as garden zones. Their use generate meaningful environments.

6. In breakwater walls, if vegetation roots in the interstices between the rocks, their naturalness can improve. Vegetation in the interstices faces problems to take root such as lack of soil and aridity due to exposure to the south or east. Then the treatments must be done on the base of the rocks, starting from the inside of the more protected breakwater wall, where it is easier for the vegetation to consolidate.

7. Gabions filled with rock seem too geometric and artificial, with problems for their integration into the landscape.

8. The vegetation planted between the bands conceals the walls of different materials (concrete panels, shotcrete, bolted concrete and their combinations).

9. Slopes should not have a measurement greater than 1V/ 3H, so that they are stable and can be revegetated without difficulties. When this is not possible, it will be necessary to use bioengineering techniques.

10. If possible, we should take advantage of existing structures, especially when they have a constructive value and are built with stone.

11. Cuts in rocky materials support high slopes. When they are oriented to the south, their environmental restoration is very difficult. To integrate the excavation slopes it is recommended to avoid hard edges and smooth walls, which give a geometrical aspect to the excavated walls. Then it is recommended to round the edges and to develop irregularities on the slope.

7. REFERENCES

García Sánchez-Colomer, M. R., Esteras, M. S., Estirad, M., González Garrido, M., Gutiérrez Muñoz, A. M. y Recuero, E. (2018), *Buenas prácticas para la integración del paisaje en los proyectos*. Madrid, España. Monografías CEDEX, M-136.