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# Advances in the design of a methodology for the identification, characterization, and assessment of and intervention in the industrial landscape

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## Abstract

The process of degradation and abandonment to which many landscapes generated by industrial decay are currently exposed, together with the lack of conceptual and methodological means required for the study of and intervention in these landscapes, would suggest that the existing approach requires revision. In this context, the aim of this article is to detail the progress being made by a research project, the objective of which is to design a methodology for the analysis and enhancement of and intervention in these industrial heritage landscapes. The project proposes a series of methodological improvements and innovations that take into account, among other issues, the specificity and identity of these landscapes, their dynamic, highly anthropized nature, the diversity of scales involved, and so forth, using a method that integrates an interdisciplinary approach, emphasizes citizen participation and incorporates the use of digital tools.

**Keywords:** Cultural landscape, Industrial heritage, Post-industrial sites, Sustainable development, Urban renewal, Social participation

## Introduction

While in recent decades, industrial heritage has become increasingly important as a cultural asset, to date it has not been sufficiently valued and studied. The landscapes generated by our industrial past both constitute a phenomenon of extraordinary complexity and are bearers of values related to the industrial culture of a very recent period in human history that must be conserved and recovered as a real part of our heritage.

While many of these landscapes are currently exposed to processes of degradation, abandonment and disappearance, and scientific study of them has, in general, been addressed belatedly, more and more researchers

and professionals in the field of heritage and landscape are recognizing the need to study, enhance, protect and plan a future for them (Sobrinho and Sanz 2019). How to approach these actions and what frameworks or methodologies should be used, however, remains unclear, and answering these questions is not an easy task (Loures 2009). The methodological and conceptual inadequacies that currently exist regarding the study and intervention in these landscapes force us to rethink how they have been approached to date and to redesign a conceptual and methodological framework that contemplates the innate specificity of these landscapes (Alba and Romero 2022).

By analyzing the most outstanding trends in the study and treatment of landscape in recent decades, we can observe the prevalence of those schools and academic traditions that approach the study of landscape from a biased standpoint that applies exclusively to those

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landscapes that are first and foremost natural or rural. As a result, a large part of these methodologies refer to spaces that have scarcely been transformed by human action.

In addition, the majority of landscape action methodologies and policies focus on the conservation and preservation of landscapes of a more exceptional nature, i.e. those characterized by their spectacular aesthetic and/or heritage value (Bertrand and Bertrand 2002), and, as such, until recently, landscapes of a more ordinary, everyday or even degraded nature, such as those generated by industrial decay, have scarcely been taken into account in landscape studies.

The Council of Europe Landscape Convention (CELC) introduces an expanded concept of landscape that contemplates not only the most outstanding locations but also more everyday, ordinary sites. This conceptualization has meant that many of the scientific, theoretical and methodological references relating to the study and enhancement of and intervention in landscapes in general are incomplete (Alba 2019), these deficiencies being more accentuated in landscapes of a more ordinary nature, such as industrial heritage landscapes.

The current conceptual and methodological situation is insufficient in terms of dealing in any depth with the study of and intervention in landscapes generated by industrial decadence. Many of the theoretical approaches and methodologies developed to date along these lines present limitations regarding their application to landscapes that have been radically transformed by human action (Brady 2008; Zoido 2012).

This raises the need for a rethink in terms of both the traditional standpoint from which these industrial heritage landscapes have been approached and the definition of a specific theoretical, conceptual and methodological framework for these landscapes that introduces a shift in the methodological trends carried out to date in an effort to address their study and management from a more profound perspective.

## Methodology

This article details the progress being made in a research project, the aim of which is to design a methodology for the identification, characterization and assessment of, and intervention in, industrial heritage landscapes. This methodological procedure will contribute to both the knowledge and analysis of the cultural value of these and the definition of basic management strategies that support the protection, planning and dissemination and enjoyment of the same based on their patrimonial and cultural interest.

In the design of this methodological proposal an effort has been made to maintain coherence with existing

international documents relating to landscape and industrial heritage. In this sense, the CELC and the guidelines for implementation of the same, instruments sponsored by the Council of Europe, have been considered key documents insofar as they serve as a reference framework in the design of policies relating to landscape study, protection, management and planning. Likewise, the standards, guidelines and recommendations drawn up in 2013 by the Council of Europe for the identification, protection and dissemination of heritage have been taken into consideration when designing this methodological proposal, especially those that specifically address industrial heritage, such as Recommendation No. R(87)24 on European industrial cities, Recommendation No. R(90)20 on the protection and conservation of the industrial, technical, and civil engineering heritage in Europe, and Resolution 1924: Industrial Heritage in Europe. Other instruments taken into consideration are those of a normative and practical nature that in recent years have made it possible to establish guidelines, references or framework standards for the enhancement of and intervention in this heritage on an international level, such as the Nizhny Tagil Charter on Industrial Heritage, which is the first international reference text for the protection and conservation of this heritage, and the Dublin Principles, which contain the joint criteria for the protection of this heritage proposed by the International Council on Monuments and Sites (ICOMOS) and the International Committee for the Conservation of Industrial Heritage (TICCIH).

The design of this methodological proposal is also based on the study of the conceptual and methodological advances made to date in the field of landscape architecture. While this proposal is a new methodological tool that has very few precedents at an international level, the fact is that numerous conceptual and methodological contributions have been made from a variety of approaches and disciplines, the theoretical and methodological aspects of which should be neither ignored nor disregarded.

The wealth of European experience in the study of landscape has given rise to an important knowledge base, the most salient landscape-oriented experiences being those carried out by public agencies in different European countries and regions. Among the new ways of analyzing and studying the landscape the most notable is undoubtedly the Landscape Character Assessment methodology, known by the acronym LCA, created by The Countryside Agency and Scottish Natural Heritage -currently English Nature- in the United Kingdom. This methodology focuses on the notion of landscape character, i.e., that which consistently characterizes a landscape and makes it unique (Swanwick 2002). Its prestige is backed by a well-corroborated

scientific background, extensive experience and substantial results. This fact, together with the central importance that this methodology gives to the characterization of the landscape in terms of attaining in-depth knowledge, completing the assessment and supporting the design of landscape actions within the scope of planning, has led to the use of this methodology as a reference framework for the design of our methodological proposal.

Use of this methodology has sought to transcend a simple exercise of methodological mimesis, and revision and adaptation of the methodology has been contemplated in an effort to offer a comprehensive response to the needs of those industrial heritage landscapes, a fact that has involved certain limitations but also the contribution of improvements and innovations that have made it possible to advance in the design of a specific methodology for the landscapes in question. Some aspects that have been addressed are the adaptation of the methodology to the diversity of scales of the industrial landscape in order to facilitate its study and analysis at different interrelated scales, the incorporation of Geographic Information Systems (GIS) to support this study, and the collection and presentation of the data in map format. In addition, since the LCA methodology predates the CELC, it has been necessary to orient and adapt some of its considerations to CELC guidelines and recommendations (Gómez and Riesco 2010).

In the design of this proposal, particular interest has been taken in other methodologies that have emerged as the result of the evolution of certain procedural aspects of the LCA methodology. This is the case of the Townscape Character Assessment and Historic Landscape Assessment methodologies, the development of these being relevant in terms of the study landscapes located in urban environments and the characterization of landscape elements as heritage-related.

The experience in identification and evaluation of landscapes in countries such as Belgium, France, Slovenia and Spain and their respective landscape atlases have also been a source of inspiration; landscape projects such as PAYS.DOC and PAYS.MED.URBAN, developed within the framework of the European Union's transnational cooperation program for the Mediterranean area, as well as Spain's experience in the elaboration of landscape catalogs and the promotion of various work methodologies and landscape analyses carried out by centers such as the Center for Landscape Studies (CEPA), with its Andalusian Landscape Catalogues, and the Landscape Observatory of Catalonia, with its Catalonian Landscape Catalogues. All these experiences are relevant examples of landscape identification and characterization that have been very useful in terms of defining a theoretical and

procedural framework for the development of this methodological proposal.

The specificity of these industrial heritage landscapes, however, has made it necessary for us to also consider a number of approaches, studies or landscape practices that, in response to a variety of interests and/or objectives, have addressed these landscapes either partially or tangentially. In this sense, the study of certain emergent methodological approaches linked to the study of industrial heritage landscapes from the perspective of their consideration as cultural landscapes (Alba 2017), or related to the registration, preservation and activation of certain landscapes such as railways from an interdisciplinary perspective (Oliveira 2017), or focused on the identification of these industrial landscapes from the adaptation and combination of approaches from earlier methodologies used in other types of landscapes (Stuart 2012; Ostreğa and Cala 2020), have allowed us to advance in the design of this methodological proposal by focusing on the particular nature of these landscapes.

Likewise, other experiences that have inspired the development of this proposal have arisen from research projects that, while not specifically focused on the study of industrial heritage landscapes, do address closely related issues. This is the case of research projects that are making progress in the design of an interdisciplinary methodological proposal for the characterization of certain landscapes of a more common, ordinary nature, such as road corridors and the technological development of these (Loren et al. 2016, 2018), or studies that advance in the definition of management initiatives for historic urban landscapes based on new methodological strategies that affect, among other issues, the sense of collective identity of these landscapes as testimony to the culture of a place and the result of human interaction on a territory over time (Benedet et al. 2020). The affinity of certain issues addressed in these investigations with some aspects that characterize industrial heritage landscapes has, over the course of this research, led us to explore the possibility of transferring certain methodological aspects to our own proposal.

The design of this methodological proposal has also been based on the study of other interventions in industrial landscapes in an effort to uncover procedures or successful approaches to the recovery of these landscapes that allow us to establish a series of methodological principles. As such, we have incorporated the study of urban planning examples such as the Llobregat River Industrial Colonies Master Plan and the Ter and Freser Industrial Heritage Urban Master Plan (Sabaté 2001, 2006), or projects such as the Emscher Landscape Park (Pérez and Parra 2004) and The Blaenavon Industrial Landscape World Heritage Site (Alba et al. 2018).

Once the design of this methodological proposal was completed, its viability was tested and studied using a specific case of industrial landscape, in this case the mining landscape of the La Reunión Mines in Villanueva del Río y Minas, Seville (Spain).

## Results

This section explains the methodological proposal developed, the design of which is based on the following principles:

- An understanding of landscape beyond its consideration as a primarily visual phenomenon, in other words, as an intimate and complex relationship between people and place.
- An approach to the study of landscape from an integrative, interdisciplinary perspective, capable of attending to both its objective and subjective, natural and cultural, ideal and material, individual and social aspects.
- A comprehensive understanding of landscape that is capable of encompassing not only the territory, but also culture and society.
- An emphasis on the study of the industrial landscape on different levels and attention to its dynamic character.
- An interest in what characterizes each landscape and makes it different from the rest.
- The incorporation of social agents and citizen participation in all phases of landscape study.

The objectives pursued in the design of this methodology are as follows:

- To identify, characterize and map industrial heritage landscape from a contemporary perspective.
- To study the historical evolution of industrial heritage landscape as well as its current and foreseeable future situations in the absence of intervention.
- To determine the values and meanings attributed to these landscapes by society.
- To diagnose the current or potential problems affecting these landscapes. This question is of great interest, since many of these are in a state of deterioration, degradation or even at risk of disappearing.
- Identify the potential offered by these landscapes as well as their use and exploitation limitations in order to guarantee their sustainability.
- To define basic intervention criteria that contemplate, on the one hand, the integration of these landscapes in action and decision-making processes such as plans, programs or interventions with territorial impact aimed at their protection, conservation, man-

agement and planning, as well as their enhancement or requalification and, on the other hand, the promotion of sustainable use of the territory.

The Fig. 1 shows a simplified form of the structure of this methodological proposal, the development of which is detailed below.

### Phase 1. Identification and characterization

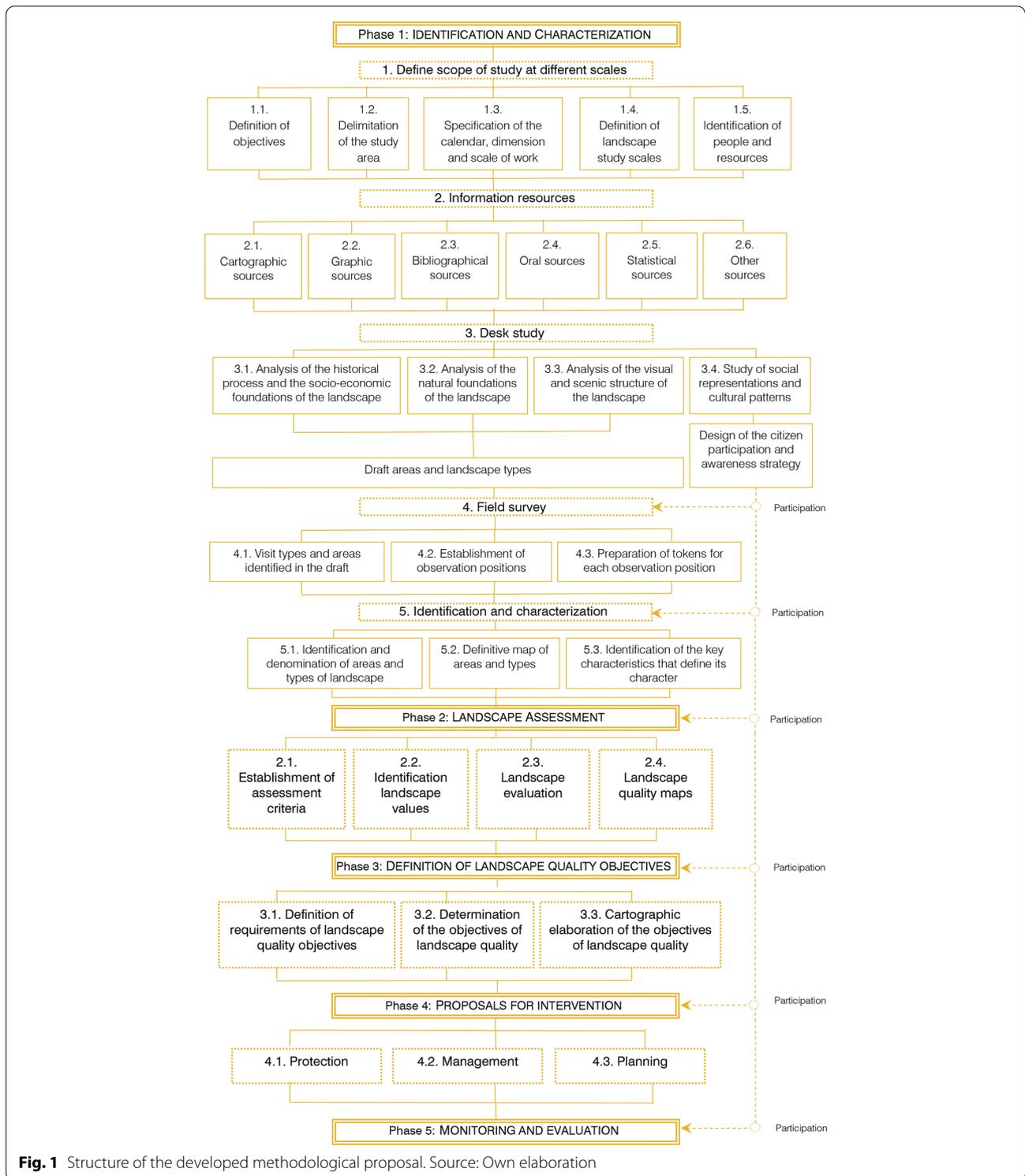
This initial phase of landscape identification and characterization acquires special relevance in the development of this methodological proposal as it includes a set of descriptive and classification tasks aimed not only at the in-depth study of and acquisition of knowledge relating to these landscapes, but also constitutes a task to be carried out prior to their assessment, to the formulation of landscape quality objectives and to the definition of any type of action to be carried out on them. This in-depth, detailed knowledge of the landscape is something that the CELC requires of signatory states or parties as a basis for the design of landscape policies.

This phase includes the development of the following tasks:

- Identification. This consists of carrying out a series of descriptive actions aimed at identifying a landscape throughout the extension of its territory and establishing a kind of census or inventory of the various clearly-defined and delimited landscape units that constitute it.
- Characterization. The objective of this task is to analyze the specific characteristics of the previously identified landscape units in their current state as well as their essential features, i.e. those that distinguish one landscape from another, without implying an assessment of their excellence (Swanwick 2002; Wascher 2005).

Landscape identification is the first step in the characterization process. This contemplates the delimitation of the different landscape units, taking as a basis those elements (natural, cultural, heritage, visual, perceptual, symbolic, etc.) that constitute their identity and define their distinctive character, defining a particular, differentiated and distinguishable physiognomy.

The task of identification and characterization does not attempt to define a hierarchy of landscape units according to their quality, but rather to acquire a broad knowledge of these landscapes, not only by describing their character, but also their individual, unique nature, that which makes it possible to place the studied landscape in a context, outline its extension and compare it with



**Fig. 1** Structure of the developed methodological proposal. Source: Own elaboration

others through the detection of its differentiating features (Mata 2002).

Each landscape unit defines a homogeneous territory that is clearly delimited and differentiated with

respect to contiguous territories and possessing its own dynamics. It is the set of qualities inherent to and that have been defining and configuring a landscape over time, as well as the significance and values that society

has been bestowed on it, which define its character and differentiate it from the rest.

In the development of this methodology it was considered interesting to adopt the process of landscape identification and characterization proposed by the British Countryside Agency and Scottish Natural Heritage (2002). In this sense, and in line with the approaches contained in the LCA methodology, a hierarchical landscape identification procedure is established in a way that the delimited territorial units are grouped into higher order categories until a relatively ordered landscape taxonomy is achieved. The basic categories established are landscape areas and types. These are intended not only to identify those aspects that are distinctive and differentiate some landscape units from others, but also to identify, through a study based on similarities, those general aspects that are shared by different, non-contiguous landscapes (Lipsky and Romportl 2007).

The proposal, therefore, is to, on the one hand, identify and map those landscape areas that have an unequivocal landscape and territorial identity and an internal homogeneity and, on the other hand, on a more abstract level, to establish a series of different landscape types, each of which results from the grouping, at a certain scale, of areas with common features distributed throughout the territory.

This task of segregating into areas and grouping into landscape types is flexible and can be repeated until a more thorough classification is achieved, and can be achieved either through progressive division into smaller units or by aggregation and merging into units of increasing size.

This iterative application of landscape areas and types at various stages of study will require the alternating of both inductive and deductive processes and will permit the study of the landscape at various related scales. This constitutes a key parameter in the study of industrial heritage landscapes insofar as they intervene on various scales and, as such, their in-depth study requires the hierarchical systematization of their analysis on different scales. As each of these scales will direct the study of the landscape in a particular direction, the use of small scales for large territorial areas will provide an overview of landscape diversity and serve as a framework for more detailed identification studies. However, as the scale of study is enlarged, the data to be taken into account in the landscape study will vary, with the result that a strictly perceptual description gives way to integrated concepts of a cognitive nature in which social participation is necessary.

The landscape unit constitutes the basic territorial unit on which the evaluation criteria will later be established,

the landscape quality objectives formulated, and intervention proposals suggested.

This task of identification and characterization would be incomplete without societal participation in the recognition of its landscapes. In this phase, therefore, not only should the study of these landscapes be structured on the basis of flexible classification and delimitation that has been adapted for the protection, management and/or planning of the same, but the insertion into and participation in the process of citizens and other social agents related to landscape policy should also be facilitated.

Given the complexity of these landscapes and the number of different variables that can constitute their characterization, we propose the development of a methodology based on the definition of a simple procedure that makes use of the maximum available information and is structured in the phases detailed below:

#### ***Phase 1.1. Definition of the scope and area of study***

The objective of this phase is to define the different study areas according to the parameters used for their delimitation. Given that the ultimate purpose of the study of these landscapes is the definition of future actions carried out on them in relation to land-use planning policies, their territorial delimitation must be carried out with the idea that the results should be of use in terms of their ability to be incorporated into land-use planning instruments. As a result, the scale(s) of land survey(s) will be defined depending on the type of planning (local, sub-regional, regional) to which the study is oriented.

*Phase 1.1.1. Definition of objectives* This first section includes a precise, clear, concise and realistic definition of the objective(s), both general and specific, that the landscape study aims to achieve during the foreseen execution period.

*Phase 1.1.2. Delimitation of the study area* The objective of this section is the delimitation and basic description (written and cartographic) of the study area(s). This initial identification of the landscape to be studied should cover its entire territory.

*Phase 1.1.3. Specification of the procedure, dimension and scale of work* First of all, a work schedule will be defined with a timeline that contemplates the activities to be carried out and their expected execution time. Subsequently, depending on the qualities of the landscape to be studied, the extension of both the report and the planimetry to be carried out will be defined as a guideline, and the different scales of the landscape study will be established depending on whether the scope is local

(1:1.000–1:5.000), sub-regional (1:5.000–1:25.000) or regional (1:25.000–1:50.000).

This section will also briefly outline the basic methodological principles on which the landscape study will be based and identify both the professionals who will participate in the work and the resources required for its correct execution. The recommendation is that the work team be multidisciplinary in nature and include specialists in the fields of landscape analysis, management and intervention, territorial planning, etc., such as architects, urban planners, archaeologists, geographers, historians, sociologists, anthropologists, etc. Special attention should also be paid to the participation of social agents (local population, experts on the area and its history, associations, town councils, universities, etc.) in the landscape study in each and every one of its phases.

### ***Phase 1.2. Information resources***

When carrying out the study of these landscapes a convenient starting point is to become familiar with available relevant data. For this, prior research should be carried out based on the meticulous search, compilation and restructuring of existing information from diverse sources (bibliographic, graphic, cartographic, oral, statistical, etc.) and from a diversity of perspectives. This should be carried out systematically in libraries, archives and other institutions that may house information related to the landscape under study. In general, much of this material is available and accessible electronically, though state-of-the-art spatial analysis tools based on GIS, remote sensing systems, etc. may also be helpful in terms of enriching the available information base.

### ***Phase 1.3. Office work***

The objective of this phase is the integrated analysis and synthesis of the structures and variables that constitute the fundamentals of the landscape under study. Their analysis will address a diversity of dimensions and highlight their specific features. As such, the study will refer both to those elements, processes or structures that define the homogeneity of the different areas, their limits and properties (historical processes and socio-economic foundations of the landscape, natural foundations, etc.) as well as to those that contribute to their individuality with respect to the rest of the territory, those that refer to their visual, scenic structure, or that reveal the links that society maintains with these landscapes (cultural, social, perceptive, traditional, etc.).

Special attention will be paid to the dynamics and interrelationships between the different components that define each landscape, identifying in each case those

more salient discontinuities that make it possible to establish distinct landscape units. This analysis should be carried out using an integrated procedure that brings together the diversity of considerations associated with these landscapes and available studies, but it should also refer to the territory as a whole, so that it contemplates not only those parts or elements considered significant or exceptional, but also those parts that are more everyday and degraded.

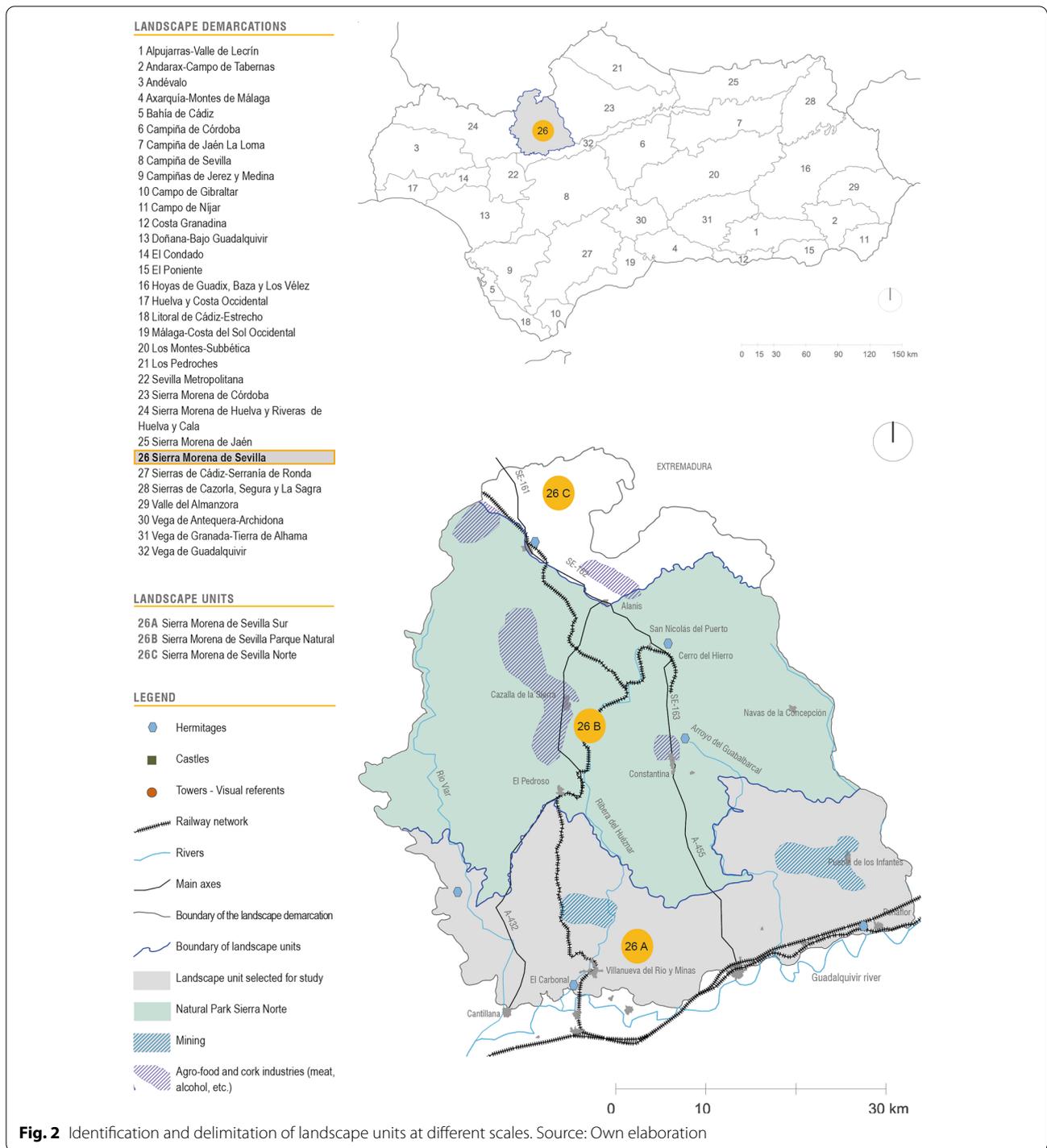
Likewise, the evolutionary processes of these landscapes should be taken into consideration via the verification of past and present as well as other foreseeable temporal dynamics derived from human and natural factors or from the pressures (or absence thereof) exerted on the territory under study, merging the historical and future (dynamics and threats) visions.

The incorporation in this phase of the participation of the population and other social agents who establish a daily relationship with this landscape through the study of social representations and cultural patterns is another fundamental element in the identification of the distinct landscape units.

Based on this study an initial draft of landscape areas and types that will include the partial results of the analyses carried out will be defined at different scales. These landscape units will be delimited, mapped and characterized with a brief text alluding to their principal characteristics. The description will be accompanied by a data sheet that will be recorded in a database where all its components will appear synthetically. Likewise, the identification and assignment of names or codes to the different areas identified will be essential, as will the definition of how they are articulated, their hierarchical relationships, their limits and the borders between them.

Following the processing of these initial results by means of geographic information systems, a first proposal for the delimitation of landscape units will be obtained (Figs. 2, 3 and 4). This first delimitation will have to be contrasted and verified through field work and subjected to a successive rectification process until reaching its definitive definition.

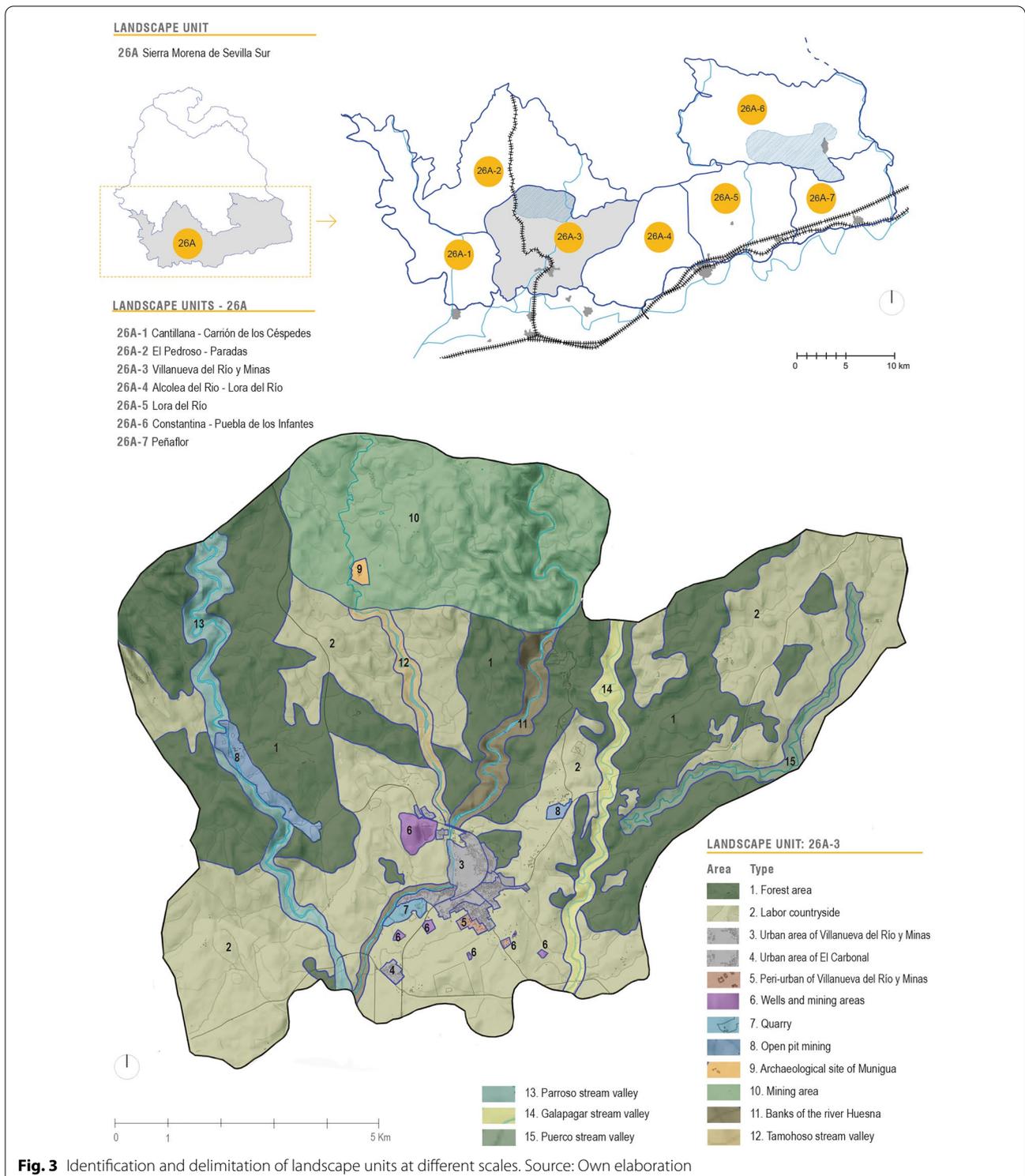
This delimitation process is not an easy task, since the landscape is configured as a continuous whole. While this delimitation is more evident in landscapes in which the physical and biological dimension predominates, in those landscapes that have been radically transformed by man, as is the case of landscapes generated by industrial decadence, we encounter social and cultural parameters, especially those linked to perception (Boira 1992; Bofarull 1982), which make this delimitation more complex. Hence the importance of paying special attention to the elements that constitute transition



**Fig. 2** Identification and delimitation of landscape units at different scales. Source: Own elaboration

areas or boundaries between adjacent landscape areas. It will also be necessary to take into consideration that this delimitation must be carried out in a manner that can be incorporated into the instruments of territorial planning and urban planning.

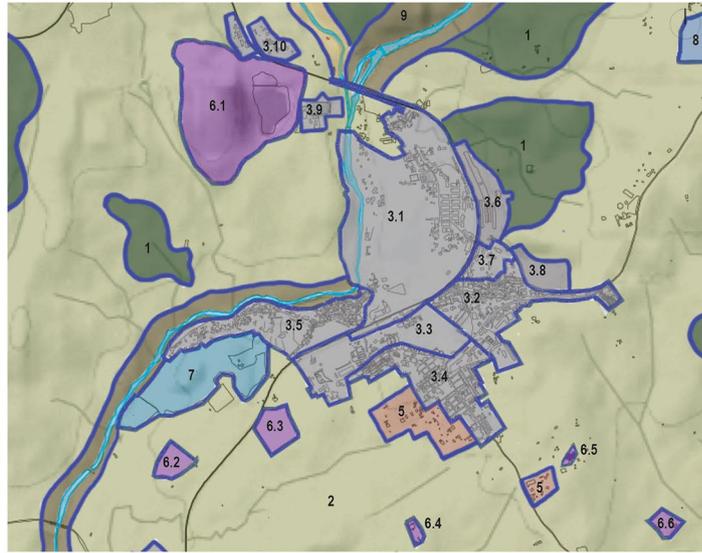
Once the different landscape units have been delimited they will be named and coded at different scales in order to facilitate their identification and geo-referencing.



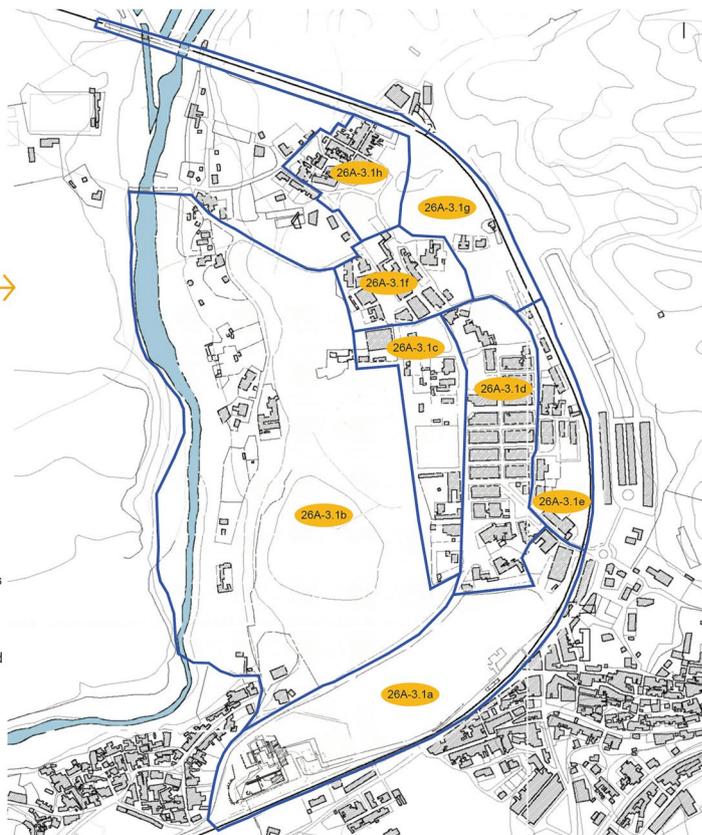
**Fig. 3** Identification and delimitation of landscape units at different scales. Source: Own elaboration

**LANDSCAPE UNIT: 26A-3**

- | Area | Type  |
|------|---|
|      | 1. Forest area                                    |
|      | 2. Labor countryside                              |
|      | 3. Urban area of Villanueva del Río y Minas       |
|      | 3.1. Historical Complex                           |
|      | 3.2. Progreso neighbourhood                       |
|      | 3.3. Grancilla neighbourhood                      |
|      | 3.4. Andalucía neighbourhood                      |
|      | 3.5. Blas Infante neighbourhood                   |
|      | 3.6. Cerrito Pinar neighbourhood                  |
|      | 3.7. Santa M <sup>a</sup> Magdalena neighbourhood |
|      | 3.8. New urban area                               |
|      | 3.9. Sports area                                  |
|      | 3.10. San Fernando neighbourhood                  |
|      | 5. Peri-urban of Villanueva del Río y Minas       |
|      | 6. Wells and mining areas                         |
|      | 6.1. Corta San Fernando                           |
|      | 6.2. Well n <sup>o</sup> 6                        |
|      | 6.3. Well n <sup>o</sup> 8                        |
|      | 6.4. Well n <sup>o</sup> 10                       |
|      | 6.5. Well n <sup>o</sup> 7                        |
|      | 6.6. Well n <sup>o</sup> 11                       |
|      | 7. Quarry   |
|      | 8. Open pit mining                                |
|      | 11. Banks of the river Huesna                     |



**LANDSCAPE UNIT: 26A-3.1**



**LANDSCAPE UNIT 26A-3.1. HISTORICAL SITE**

- 26A-3.1a Well n<sup>o</sup> 4 - Well n<sup>o</sup> 5 - Industrial workshops
- 26A-3.1b Mine dumps
- 26A-3.1c Equipment
- 26A-3.1d Confianza - Casas Nuevas neighborhood
- 26A-3.1e Train station - Equipment
- 26A-3.1f Centro - Velarde neighbourhood
- 26A-3.1g Iron Bridge
- 26A-3.1h San Fernando neighbourhood

**Fig. 4** Identification and delimitation of landscape units at different scales. Source: Own elaboration

**Phase 1.4. Fieldwork**

This phase will include in situ reconnaissance of the landscape in an effort to acquire in-depth knowledge of the same, since there are elements and dynamics that are very difficult to capture by any other means. The appreciation of those features having an aesthetic and perceptual nature, their evaluation, and the detection of recent dynamics and trends not recorded thus far will make it possible to verify, complement, contrast and update the data obtained in the previous phase by validating or correcting the definition and delimitation of the identified landscape units, thereby contributing to the characterization of these landscapes according to their diversity and complexity.

This fieldwork will be carried out over a series of distinct operations. It would be advisable to carry out a first operation once the general area of study has been defined in an effort to establish an initial contact that will allow us to observe the landscape elements that constitute the area, the relationships that have made its structure possible, and to begin a photographic catalog. A second campaign will be carried out once the different landscape units have been identified and delimited. This will consist of visiting each of the landscape units in order to confirm or correct their delimitation and evaluate them directly. Finally, a third campaign will be carried out to collect information through citizen participation. This will be carried out through interviews with landscape experts and surveys of the local population.

**Phase 1.5. Identification and characterization**

The objective of this phase is the identification and definitive characterization of the different areas and landscape types outlined above. To this end, we will proceed, based on the information and reflections gathered so far, to the elaboration of synthesis documents that include the following aspects (Figs. 5, 6 and 7):

- Identification and general description of the key characteristics that define its landscape character.
- Analysis of the pressures, factors and evolutionary processes that currently affect its characterization, as well as the dynamics responsible over time for its current structure and physiognomy.
- Elaboration of a definitive map that contemplates the spatial delimitation and final characterization of the different areas and landscape types and integrates the diversity of elements that constitute these.
- Designation of the different landscape units. This should be brief, clear, descriptive, understandable and expressive of the identity of each territory.

- Elaboration of a wide-ranging, complete characterization sheet for each of the identified areas and types, including the results of this phase.

This documentation should be approached from an interdisciplinary perspective through cooperation, collaboration and communication among experts from different disciplines in an effort to facilitate the study of these landscapes from a diversity of perspectives (territorial, social, environmental, economic, urban, geographic, archaeological, historical-functional, perceptual-visual, etc.) that guarantees their analysis and management in all their complexity. It will also be advisable to update this information on a regular basis, especially when these landscapes are affected by rapid transformations.

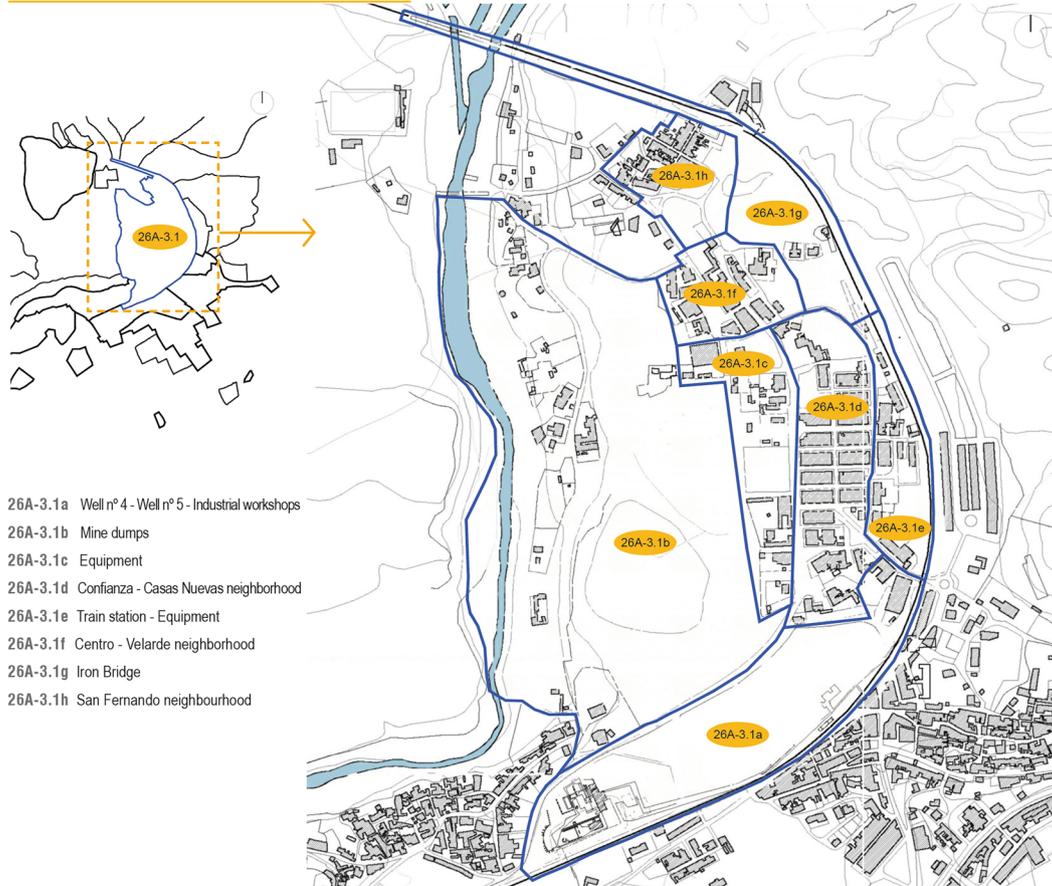
The use of a database that takes into account the use of Building Information Modeling (BIM) tools and GIS systems will facilitate the performance of this task by allowing the information generated in the study of a specific landscape to be transferred, thereby supporting the implementation of the methodology in each of its phases and favoring effective coordination of the different disciplines and agents involved in its study, including the citizens themselves, whose participation in this process is essential.

**Phase 2. Landscape assessment**

The article 6c of the CELC establishes identification and qualification as tasks associated with knowledge of the landscape. The first of these has already been discussed above. In this second phase we will focus on qualification, which consists of the assessment of the previously identified landscapes but bearing in mind the particular values attributed to them by social agents and the affected population (Council of Europe 2000).

This work requires extensive participation by the population since it must reflect the valuation of the quality of landscapes, as perceived by the general public and other social agents. The principal limitation in the carrying out of this task is the scarcity of systematic information available on social organization around the landscape. This limitation is even greater for landscapes generated by industrial decadence, where we often find a lack of appreciation and sensitivity that leads to their deterioration and degradation.

Addressing these limitations becomes a fundamental task, hence the importance of designing strategies of appropriation and citizen participation via surveys, campaigns, polls, etc. that allow this qualification procedure to contemplate, in a transparent and methodical manner, not only those landscape aspects of a more objective character, but also those of a more subjective, qualitative and social nature (Fig. 8).

**IDENTIFICATION AND CHARACTERIZATION****LANDSCAPE UNIT: 26A-3.1. HISTORICAL COMPLEX****DESCRIPTION**

The historical complex of Villanueva del Río y Minas is located in the first foothills of Sierra Morena and on the edge of the Ribera del Huéznar. Its origin is found in the mining town that was founded a century ago, as a result of the exploitation of the natural resources of the area and as a consequence of the demographic movements that this activity entailed. Coal extraction was carried out mainly through underground galleries, except in the North, where open-cast mining was carried out, as a result of the syncline of the coal bank. Thus, a town linked to the extractive activity of coal arose, so that, as the mining facilities grew, the town increased through the construction of new neighborhoods without any planning and unconnected with each other. To this lack of connection should be added the passage of the railway line that crosses and divides the town from North to Southwest. We can distinguish four types of buildings: workers' villages, employee and managerial villages, community service buildings and industrial buildings, and mining wells.

- Worker villages: Among them, the Confianza neighborhood and the Velarde and Constanca neighborhoods stand out, both built around the old wells of the same name. Years later the Progreso, Centro, Balbo and Transwaall neighborhoods would be built.

- Employees and managers villages: The San Fernando-Cabrerizas neighborhood was intended for housing for middle-class employees, while the Casas Nuevas neighborhood was intended for housing for high-ranking officials and qualified employees. The house of management, the house of the chief engineer and the house of the technical director are located in it.

- Community services buildings: The company not only provided housing for its employees, but also took care of community services. We find within this urban complex the Theater-Cinema, the Church, the School for Boys and Girls, the Commissary, the Hospital, the Slaughterhouse-butcher shop, etc.

- Industrial buildings and mining wells: Within the Villanueva del Río y Minas urban complex, wells No. 4 and No. 5 stand out, along with the industrial buildings developed around them and their dumps. Well no. 4 was the main extraction well between 1880 and 1908. Among other facilities, the Central Office of the Interior Directorate was installed there, where the so-called "Thiéry Map" was drawn. At present, this office and the rest of the facilities of well No. 4 have been demolished, leaving only the chimney.

Between 1893 and 1898, shaft No. 5 was opened, whose main facilities were the extraction winch served by a Bollinckx steam engine, the machine house, the sieves and washers, the boiler rooms, the smoke outlet chimneys, the Schlamms reservoirs and power station.

Finally, it should be noted that with regard to housing planning there was a clear differentiation of social classes. To the north were the neighborhoods of the chiefs and positions (endowed with equipment), separated by the train track from the neighborhoods to the south destined for the miners.

In the same way, we observe how the mining facilities are distanced from the houses and facilities (with the exception of the Confianza neighborhood) to thus configure a space for production differentiated from the space for consumption.

**Fig. 5** Identification and characterization of a landscape unit. Source: Own elaboration

**IDENTIFICATION AND CHARACTERIZATION**  
**LANDSCAPE UNIT: 26A-3.1. HISTORICAL COMPLEX**



Mining complex and Well nº 5



Civil Guard barracks house



M.Z.A. Schools



Company store



Mining complex and Well nº 5



Well nº 4

**MINING ACTIVITY**

The mining work carried out in Villanueva del Río y Minas, with the exception of one last open-pit operation, was carried out through underground galleries, which configured a fascinating, although currently inaccessible, underground landscape. These underground workings find their explanation in the form of a syncline of the coal bank, which only outcrops on the surface to the north.

It should be noted that the mining activity of this town reached its maximum splendor with the arrival of the railway company from Madrid to Zaragoza and Alicante (M.Z.A.). An important part of the success of this company must be attributed to the engineer Edmund Thiéry, who unified the underground works, opened new wells and built new industrial facilities. The close relationship established between the mines and the railway was also decisive at this stage.



- 1. House of Directors and gardens | 2. Theater-Cinema M.Z.A. | 3. Church | 4. M.Z.A. School | 5. Offices | 6. Economato | 7. Old offices and archives | 8. Civil Guard Barracks House | 9. Old mechanical workshops | 10. Old carpentry and foundry workshops | 11. Old chipboard factory | 12. Old covered dock and semi-ruined tower | 13. Old laboratories | 14. Management room | 15. Warehouse and plumbing | 16. Barns | 17. Showers and changing rooms | 18. Headframe and Well nº 5 | 19. Power station | 20. Headframe | 21. Old Boilers | 22. Chimney of Well nº 5 | 23. Extraction machine | 24. Old Schlamm's Ponds

**CHRONOLOGY**



La Reunión mine

**Antiquity.** There is evidence of the exploitation of the mineral resources of this territory 8 kilometers from Villanueva del Río y Minas, in the megalithic city of Mulva (ancient Munigua)  
**16th and 17th centuries.** Knowledge of the existence of the coal deposit and of some sporadic exploitation.  
**18th century.** Granting of the first licenses for the exploitation of stone coal.  
**1771.** The Royal Villanueva Mining Company was established and a few years later, after ceasing imports of English coal, it began to supply a series of forges in Seville, Carmona, Osuna and Ecija.

**Fig. 6** Identification and characterization of a landscape unit. Source: Own elaboration

**IDENTIFICATION AND CHARACTERIZATION**

**LANDSCAPE UNIT: 26A-3.1. HISTORICAL COMPLEX**

**WAYS OF LIFE**

Local life was dominated in all aspects by the company M.Z.A. who exercised absolute control over the economic and social aspects of this town. This company not only provided housing for employees, but also took care of services such as lighting, health, pharmacy, water, schools, commissary, etc. and was in charge of building the church and the theater-cinema.

So important was the domain of this Company in all aspects of life that the City Council would move from the old town of Villanueva del Río to the new town of Villanueva de las Minas.



Company Employees



Company employees in front of the door of the workers social club

**CULTURAL MANIFESTATIONS**

"(...) although the mines no longer exist we miners are still here.

Although some today are not they will remember you from afar wishing they are always return to his village one day although the mines closed they will always be miners."

Fragment of the Proclamation of the Pilgrimage of Santa Bárbara, patron saint of miners.



Well nº 4, Villanueva del Río y Minas. P. Bucuet

**CHRONOLOGY**

1789. The Royal Villanueva Mining Company was dissolved and the English company that exploited Riotinto (Huelva) began to take an interest in these deposits in order to obtain fuel for its copper smelters. Ultimately, these negotiations failed.

1796-1810. The exploitation of the mines became dependent on the Royal Artillery Factory of Seville, allowing local exploitation in exchange for 1/5 of the production.

1810. Interruption of exploitation as a result of the occupation of Seville by the French army.

1815. Resumption of exploitation tasks, but without the tutelage of the directors appointed by the General Directorate of Artillery. The exploitation of these deposits is granted to the "Compañía de Navegación del Guadalquivir y Canal Fernandino".

1830. Several private companies are established in the place.

1832-1836. The El Pedroso mining company obtains concessions on the left bank of the Huéznar River. This company also owns the Cerro del Hierro mines and decides to set up a forge in El Pedroso, for which it hires a Russian engineer from Riotinto, and the Artillery officer Francisco Antonio de Elorza, who had also organized the Malaga steelworks of Heredia. This forge will maintain its supply of Villanueva until its bankruptcy.

1840. The Compañía de la Reunion is created, led by Elorza, which unifies the mines of El Pedroso, with the mines exploited by the neighbors to the south and east. Under the direction of Elorza and later Napoleon Lionnet and Edmundo Thiery, a French mining engineer, two essential conditions were established for proper large-scale exploitation: sufficient capital and good technical management. This translated into an increase in the production of its mines and in the safety of the operations.

1858. All the properties of the Compañía de la Reunion are acquired by the company "Crédito Mobiliario Francés", a railway concessionaire in Spain.

1882. The Railway Company from Madrid to Zaragoza and Alicante (M.Z.A.), after having obtained the rest of the concessions, acquires this year those that still belonged to the Guadalquivir Company. All the Reunion Mines are thus unified and are closely linked to the railway.

1882-1941. Stage of greatest splendor of the Reunion Mines. The previously started underground works are unified, new wells are opened, new facilities are built, etc. so that, as the latter grow, the town increases through the construction of new neighborhoods.

1941. The property of the mines passes into the hands of the State, this nationalization will go parallel to its crisis.

1972. The definitive closure of the operations is decreed and a year later a private company decides to carry out an open-pit operation in the San Fernando mines.

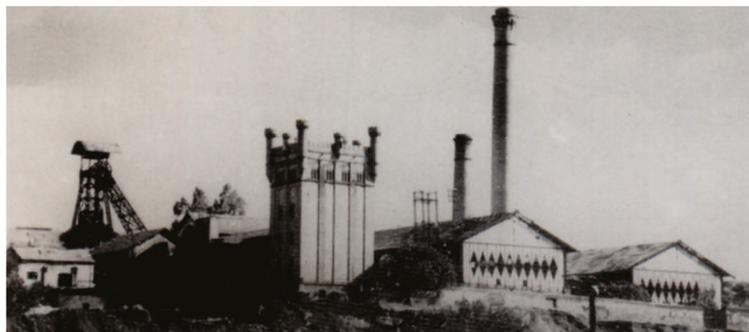
1986. The RENFE properties were transferred to the National Heritage Secretariat, and these were transferred to the State concessionaire IMPROASA in the same year. This authorized the liquidation of real estate, with the exception of those likely to be exploited by the company ENDESA and undeveloped land. This resulted in the sale of most of the facilities for scrap and the looting of the rest.

1988. The General Directorate of Cultural Assets opens a file to declare the Mines of La Reunion as a historical complex.

2002. The Mines of La Reunion are declared a Site of Cultural Interest with the category of Historical Complex by the Ministry of Culture, registering in the General Catalog of Andalusian Historical Heritage.

Present. Despite the fact that specific interventions have been carried out in some of the buildings that are still preserved, the general state of the Historical Complex is one of abandonment and progressive degradation.

**MAIN VIEW**



Mining complex and Well nº 5. 20th century



Mining complex and Well nº 5. 21th century

**Fig. 7** Identification and characterization of a landscape unit. Source: Own elaboration

**SURVEY**

LANDSCAPE UNIT: \_\_\_\_\_ N°: \_\_\_\_\_ Date: \_\_/\_\_/\_\_

**A. LANDSCAPE PERCEPTION**

A.1. Survey respondent data

- Place of conducting the survey: .....

- Relationship with the municipality of Villanueva del Río y Minas: Resident  Tourist  Work reasons  Others: .....

- Reason for presence in the area: .....

- Place of birth: ..... Age: ..... Sex: ..... Place of resident: .....

A.2. Landscape identification

- Do you agree with the limits of this Landscape Unit? (See map) Yes  No

- Do you agree with the name chosen for this Landscape Unit? Yes  No

A.3. Relationship with the landscape

- What relationship do you have with the landscape?

	Nothing	Enough	A lot
<input type="radio"/> I go during my free time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/> I have emotional ties	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/> I like it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/> I am worried about its future	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/> I feel it as my own	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/> Others (specify): .....			

**B. IDENTIFIED PROCESSES, DYNAMICS OR CONFLICTS OF THE LANDSCAPE**

Abandonment and degradation  Pillaging  Increased contamination/waste  Urban pressure  Increased population/environmental pressure

Others (specify): .....

- In recent years, do you think that this Landscape Unit has been transformed?: Slowly  Quickly  It has not been transformed

- Include dynamics and threats: .....

- Do you want to add a comment? .....

**C. ASSESSMENT OF LANDSCAPE QUALITY OBJECTIVES**

- What are the most remarkable elements of this landscape? Indicate in the table the values that you think these elements have.

Element	Heritage	Cultural	Aesthetic	Visual	Environmental
.....	<input type="checkbox"/>				
.....	<input type="checkbox"/>				
.....	<input type="checkbox"/>				
.....	<input type="checkbox"/>				
.....	<input type="checkbox"/>				

- Bearing in mind that landscape value is the relative value assigned to each landscape unit for heritage, cultural, aesthetic, visual or environmental reasons, what landscape value would you give to this landscape unit?

- Maximum  Very high  High  Medium  Low

**D. ASSESSMENT OF THE PROPOSED ACTIONS IN THE ACTION PLAN**

- Assess the priority and urgency of these actions to improve this landscape unit (See intervention proposals and action plan)

- Action nº 1: .....

- Action nº 2: .....

- Action nº 3: .....

- Action nº 4: .....

- Action nº 5: .....

- Action nº 6: .....

- Action nº 7: .....

- Propose, if desired, new intervention proposals to be carried out in the landscape unit: .....

.....

.....

**Fig. 8** Model survey of perception and assessment of the landscape. Source: Own elaboration

This qualification does not necessarily have to be quantitative, since the complexity of these industrial heritage landscapes and their consideration as cultural landscapes

prevents their translation into a numerical value. What is important is that this evaluation aims, on the one hand, to recognize, attribute and activate the values of these

landscapes and, on the other, to clarify which parts of the territory require intervention.

It is important that this landscape qualification or assessment phase be continuously fed back into the previous phase, and vice versa. The perceptions obtained in this phase may even provide guidelines that lead to a revision of the previous classification of the various landscape units. For this reason, on completion of this landscape assessment stage the landscape units defined in the previous stage should be reconsidered.

The development of this landscape assessment includes the following phases:

### **Phase 2.1. Establishment of assessment criteria**

Landscape possesses an intrinsic value that is defined by the sensations it produces in those who observe it. The purpose of this preparatory assessment phase aims to identify the specific criteria on which this assessment process will be based.

### **Phase 2.2. Landscape values**

This phase consists of the identification of those more significant values, both current and historical, that define the character of the landscape under study and can be attributed to both the overall territory and to each of the identified landscape units. This work should consider the values attributed by both the agents who intervene in these landscapes and the population that enjoys them.

This identification of values (heritage, aesthetic, productive, historical, social, symbolic, identity, etc.) should be based on the contemplation of these landscapes in all their dimensions. For the identification of those values that have a more cultural or perceptive nature and are therefore related to a more subjective component, both citizen participation and the exploration of the cultural heritage of the area will be taken into account, using as a reference the existing artistic, literary, scientific and other representations of the landscape under study.

Following this we will proceed to the cartographic representation of the different values of the landscape in question. Those aspects that cannot be mapped will be written down in a summarized form on the map and in a section dedicated exclusively to text, the objective being to develop graphic material that offers a global, comprehensive vision of each landscape unit according to its values.

### **Phase 2.3. Landscape assessment**

In this phase a study will be carried out of the threats, weaknesses, strengths and opportunities presented by each landscape unit, as well as the entire area under study. To this end the maps prepared in the previous

phase on the values of the landscape will be used as a reference.

Through analysis and interpretation of the same, those issues that are considered truly significant for each landscape unit will be extracted synthetically in an effort to highlight the problems and opportunities detected as well as the threats and potential of the values of the current landscape. This will also be carried out for the area as a whole.

The carrying capacity of these landscapes will also be studied, this being the degree to which an area or type of landscape is capable of withstanding changes without undergoing substantial modifications to its character. And finally, a series of landscape-quality maps will be drawn up showing the assessment of the different landscape units studied from a heritage, cultural, social, productive, functional, symbolic, perceptive (etc.) *perspective* in relation to their state of protection, management and planning (Fig. 9).

### **Phase 3. Landscape quality objectives**

The definition of landscape quality objectives is one of the CELC's most important precepts, as these express a society's aspirations in relation to the characteristics of the surrounding landscape. Their formulation incorporates a propositional stage into the landscape evaluation process, these together constituting the preliminary phase on which to subsequently formulate the different lines of action to be undertaken and their relative weight in terms of achieving these objectives.

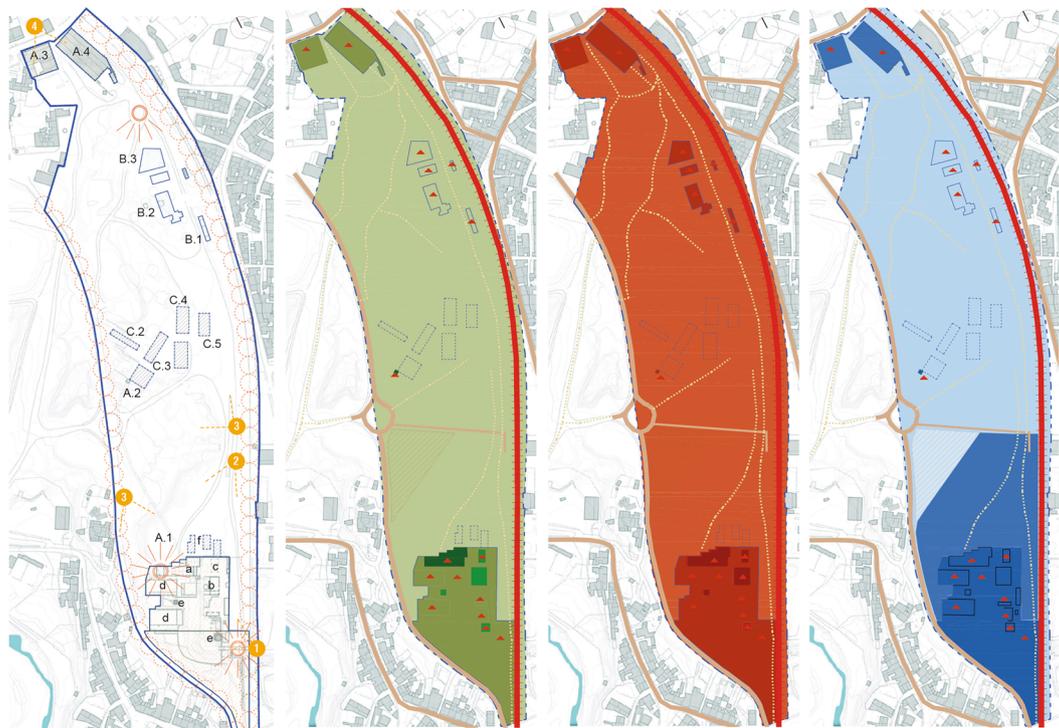
This stage should combine the expert analysis carried out in terms of characterization, qualification and diagnosis with the results obtained in the public participation process. This means that these objectives should be elaborated through articulation of the social needs and values that the population attributes to these landscapes with the political decisions that affect the landscape components.

Given the relevance that social agent participation acquires in this phase, what is required is not merely a degree of mobilization of resources and social conditions, but also that citizens are able to express their aspirations and desires with respect to landscapes generated by industrial decay. This presents a significant challenge, for the same reason that combining these contributions with actions linked to their protection, management or planning is no easy task.

The definition of these landscape quality objectives must be based on the consideration of these landscapes as part of land use and urban planning processes. To this end, they must be considered in relation to the territorial governance instruments into which they are incorporated as well as the sectoral policies that may affect

**LANDSCAPE ASSESSMENT**

**LANDSCAPE UNIT: 26A-3.1a: WELL N° 4 - WELL N° 5 - INDUSTRIAL WORKSHOPS**



<p> Static visibility points</p> <p> Dynamic visibility points</p> <p><b>Buildings and mining facilities</b></p> <p>A.1_Well n° 5. Facilities+chimneys a. Power station / b. Power house / c. Headframe / d. Boilers / e. Chimneys / f. Mining washing site</p> <p>A.2_Chimney Well n° 4</p> <p>A.3_ Old carpentry and foundry workshops</p> <p>A.4_ Old mechanical workshops</p> <p><b>Dilapidated buildings</b></p> <p>B.1_ Old laboratories</p> <p>B.2_ Old covered dock and tower</p> <p>B.3_ Old chipboard factory</p> <p><b>Missing buildings</b></p> <p>C.1_ Old coal washing site</p> <p>C.2_ Management room</p> <p>C.3_ Showers and changing rooms</p> <p>C.4_ Warehouse and plumbing</p> <p>C.5_ Barns</p>	<p><b>SOCIAL ASSESSMENT IN LANDSCAPE. POPULATION PREFERENCES</b></p> <p> Edification</p> <p> Roads</p> <p> Railway</p> <p> Hydrography</p> <p> Paths</p> <p> Parking</p> <p> Scope of landscape unit</p> <p> Valued architectural or archaeological heritage elements</p> <p> MAXIMUM</p> <p> VERY HIGH</p> <p> HIGH</p> <p> MEDIUM</p> <p> LOW</p>	<p><b>HERITAGE AND CULTURAL ASSESSMENT IN LANDSCAPE</b></p> <p> Edification</p> <p> Roads</p> <p> Railway</p> <p> Hydrography</p> <p> Paths</p> <p> Parking</p> <p> Scope of landscape unit</p> <p> Valued architectural or archaeological heritage elements</p> <p> MAXIMUM</p> <p> VERY HIGH</p> <p> HIGH</p> <p> MEDIUM</p> <p> LOW</p>	<p><b>VISUAL QUALITY ASSESSMENT IN LANDSCAPE</b></p> <p> Edification</p> <p> Roads</p> <p> Railway</p> <p> Hydrography</p> <p> Paths</p> <p> Parking</p> <p> Scope of landscape unit</p> <p> Valued architectural or archaeological heritage elements</p> <p> MAXIMUM</p> <p> VERY HIGH</p> <p> HIGH</p> <p> MEDIUM</p> <p> LOW</p>
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**Fig. 9** Assessment of a landscape unit. Source: Own elaboration

them, either directly or indirectly (Fabeiro 2006). For the formulation of these, the following tasks are taken into consideration:

### **Phase 3.1. Definition of the attributes of landscape quality objectives**

In this phase the criteria to be met by landscape quality objectives will be defined, paying special attention to issues such as those enunciated by Edvardsson (2007):

- These should be precise, concise and easy to understand.
- They should not be too rigidly formulated and, as far as possible, should be established in a structured, hierarchical manner that avoids the creation of a heterogeneous list of conceptually disjointed aspirations.
- Their definition should cover both the entire territory under study as well as the various identified landscape units.
- They should be coherent and adapted to the aims and guidelines of the various laws, conventions, agreements and norms, both national and international, to which they are subject.
- They should be evaluable.
- Their progress should be verifiable.
- They should be acceptable and attractive to the majority of the population.

### **Phase 3.2. Determination of landscape quality objectives**

Initially, general quality objectives will be defined based on the more significant aspects of the landscape in question and which will be applicable to the territory as a whole. Subsequently, more specific objectives will be defined for each of the identified landscape units (types and areas), according to their particular characteristics.

The formulation of these quality objectives should take into account the conclusions drawn during the previous phases in relation to the character of the landscape, transformation dynamics, condition, assessment, etc. As it is essential that these are aimed at the interests of the citizens, it will be necessary to bring them to the attention of the population and corroborate them via a process of consultation and citizen participation using workshops, interviews, surveys, etc. In other words, while the definition of these objectives must be carried out by work teams led by experts, the incorporation of social agents must be guaranteed at all times.

Once the various quality objectives have been established, strategic lines of action associated with these will be defined, and include:

- Protection and conservation of landscape values in order to avoid their deterioration or loss.
- Management of the landscape from a sustainable development perspective that ensures maintenance of the same.
- Restoration and enhancement of the landscape in an effort to avoid the degradation or disappearance of characteristic elements.
- Improvement of the existing landscape character.
- Integration of the landscape under study into territorial and/or urban planning processes.
- Territorial intervention aimed at the creation of a new landscape.
- Combinations of the above alternatives.

### **Phase 3.3. Cartographic elaboration of landscape quality objectives**

A map will be drawn up that includes the objectives defined in the previous phase, covering the whole area in general and each of the landscape units in greater detail (Fig. 10).

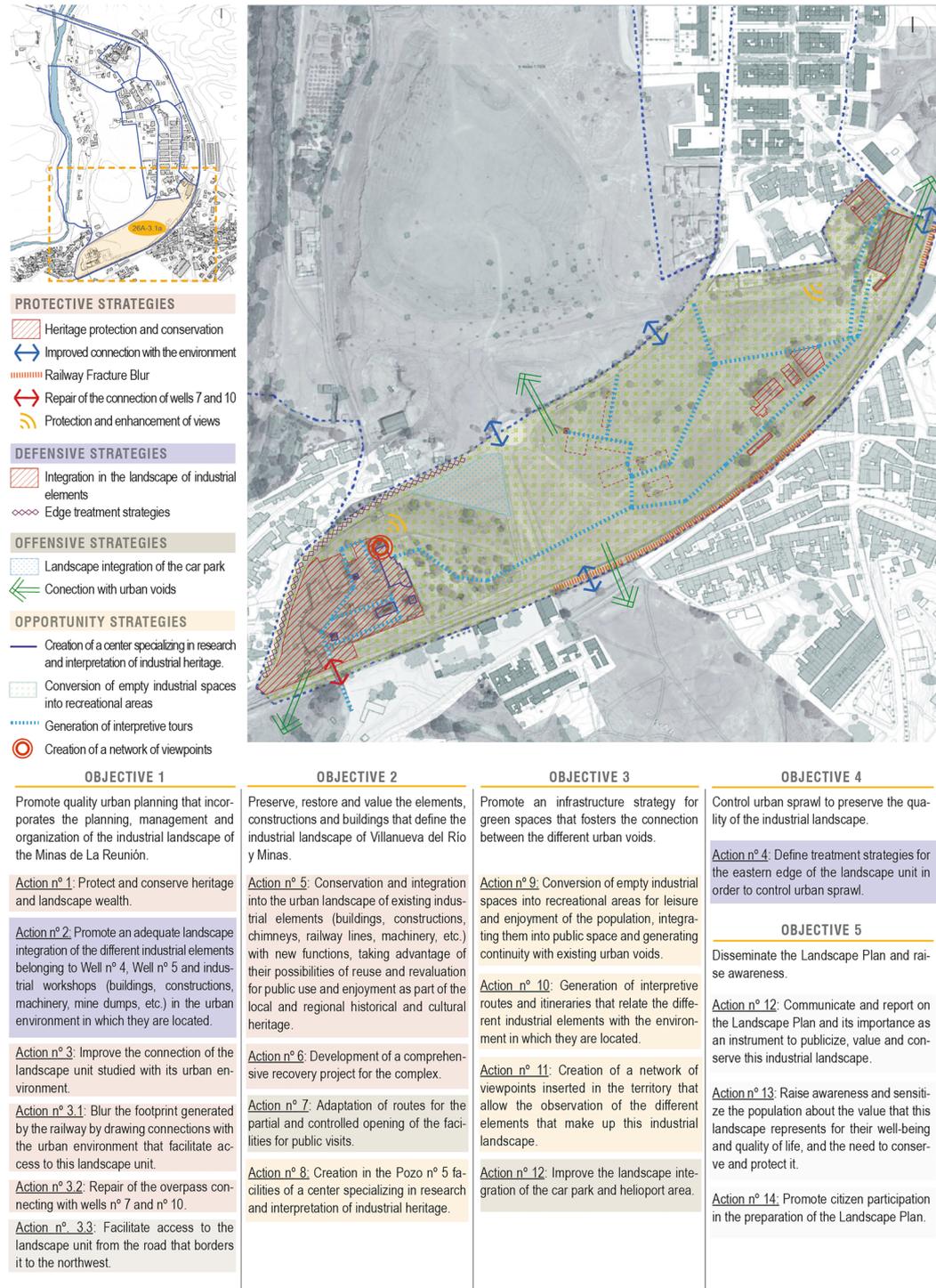
### **Phase 4. Intervention proposals**

This phase will establish the criteria and specific actions to be undertaken by the competent authorities and the public in order to achieve the landscape quality objectives defined in the previous phase. These are aimed mainly at territorial, urban and sectoral policies. As stated in the CELC and further developed in the document Recommendation CM/Rec (2008)3 of the Committee of Ministers to the member states on guidelines for the implementation of the European Landscape Convention, these actions should ensure, among others, the objectives of the following principles: the formulation of landscape strategies, the integration of landscape into territorial and sectoral policies, the implementation of public participation and respect for landscape quality objectives.

The definition of an action plan should translate the landscape quality objectives into a proposal for criteria, actions, guidelines, recommendations and projects aimed at achieving the objectives in question. During its elaboration those criteria and general actions with the greatest impact on both the territory as a whole and on the separate landscape units will be selected. This plan should combine actions relating to protection, management and planning in an effort to reconcile, throughout the area, the preservation of the territory's values with its daily use as well as with creativity in terms of new events that may occur in the area in question (Zoido 2004) (Fig. 10). Citizen involvement in both decision-making and implementation and administration over time will be an essential feature of this task.

**LANDSCAPE QUALITY OBJECTIVES AND PROPOSALS FOR INTERVENTION**

**LANDSCAPE UNIT: 26A-3.1a: WELL N° 4 - WELL N° 5 - INDUSTRIAL WORKSHOPS**



**Fig. 10** Landscape quality objectives and landscape unit intervention proposals. Source: Own elaboration

The various landscape measures and actions should respond to the following characteristics:

- Maintenance of a clear relationship with the landscape quality objectives.
- The addressing of both the entire area under study and each of the identified landscape units in such a way that no part of the territory falls outside the landscape action.
- Both the considerations made by the team of experts and the results obtained from consultations and citizen participation actions should be taken into account.
- Transcend preservation and conservation proposals in an effort to propose future actions that emphasize the more relevant, characteristic aspects.
- The addressing of both territorial and sectoral policies at all levels of administration and society.
- Aspire to a strong pedagogical and public awareness component.

#### Phase 5. Follow-up

The phase consists of the on-going monitoring and assessment over time of the actions defined in the previous phase, whether these are related to protection, management or planning, in order to establish, if necessary, a possible redefinition of these actions. In order to carry out this follow-up, a series of environmental, cultural and social indicators that can be understood by the population, politicians and public agents will be formulated, based on the landscape quality objectives.

In this phase, citizen participation is considered especially relevant in terms of contributing to the monitoring of the evolution of the different interventions and to the general prevention of actions harmful to the landscape (Priour and Drousseau 2006).

#### Conclusion

The methodological proposal developed here aims to address the challenges of studying, assessing and intervening in these industrial landscapes in their condition as a resource, historical-cultural testimony and environmental factor of growing importance for the quality of life of the general public. This proposal contributes in part to solving the issue of the scarcity and/or embryonic state of existing investigations that approach the industrial heritage from its consideration as cultural landscape as well as the obsolescence of the instruments and methodologies used in the study and management of the same, which is currently limited to traditional parameters.

While this proposal is based on the study of theoretical and methodological principles that have already been

carried out in this field from a variety of approaches and disciplines, it does, however, offer advances via the contribution of improvements and innovations that contemplate, among other issues:

- The specificity of these industrial heritage landscapes through their consideration as landscapes that have been radically transformed by previous industrial activity, as possessors of great cultural and patrimonial value and as custodians of collective memory.
- The complexity of these landscapes, by means of comprehensive study that addresses all their dimensions (territorial, cultural, social, heritage, etc.) and uses as a reference the totality of the territory in an effort to understand these landscapes as part of a whole, the components of which are considered simultaneously in their interrelationships.
- The diversity of spatial scales in which these landscapes participate, approaching their study in an interrelated manner and at different scales.
- The dynamic nature of these landscapes and their transformation over time as a consequence of changes in production methods and systems, industrial and economic activity, the culture of a society and its ways of life, etc.
- An interdisciplinary approach, via the definition of cooperation, collaboration and communication strategies between experts from a variety of disciplines in order to approach the study of these landscapes from a diversity of perspectives in an effort to ensure their analysis and management in all their complexity.
- The incorporation of social agents in the various phases of the study and management of these landscapes in an effort to involve the local population not only in the initial phases of the study, as is customary, but also in the other phases, such as the identification and determination of the resources and values attributed by society to these landscapes, which are susceptible to social use, or participation in their administration by the offering of creative solutions that are more responsive to the broad spectrum of variables that affect human action on these landscapes, and promotion of the social use of these territories in order to contribute to their improvement.
- The use of digital tools such as GIS, not only as an aid to coherent, easily-understandable representation, analysis or structuring of the vast amounts of data and information afforded by these landscapes, but also at the heart of the project itself as a means of promoting the effective coordination of the various disciplines and agents related to the comprehensive study and management of these landscapes, including the general population itself.

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## Author contributions

The first author has conceptualized, designed the research and written the paper. The second author has contributed to the revision of the manuscript for its publication. Both authors read and approved the final manuscript.

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## Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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