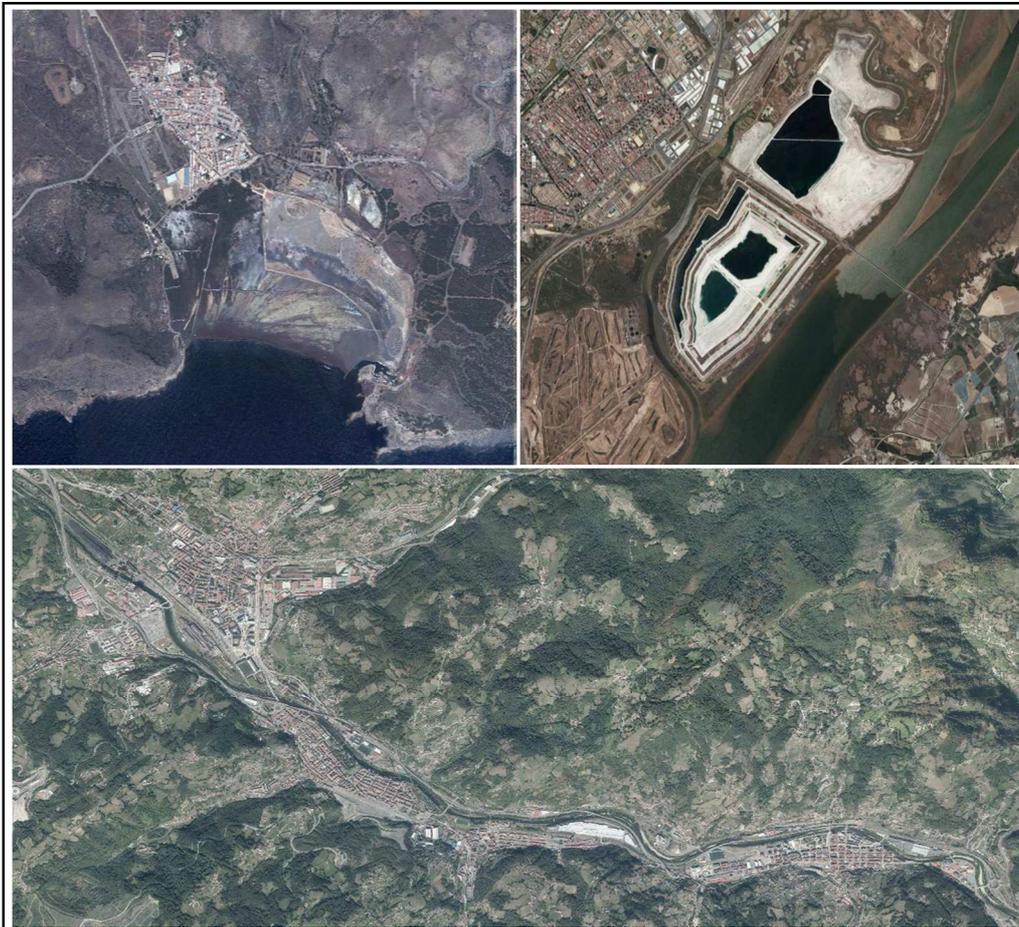




MASTER THESIS:

SUCCESS FACTORS FOR BROWNFIELDS REDEVELOPMENT IN SPAIN

**A comparative analysis of three examples of brownfields with
different status**



Aalborg University - København

Department of Development & Planning

MSc in Land Management. Semester IV. June 2016.

Author: **J. Daniel González Carmena**



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Abstract:

The aim of this project is to state a mainly qualitative comparison between three cases of brownfields in Spain, looking for the identification of factors of success in the process of redevelopment of the affected area.

The project embraces an Introduction and Pre-analysis of the brownfields phenomenon, followed by the identification of the problem and the subsequent Problem Formulation, then a conceptual-analytical framework that shapes the methodology of analysis, plus the description of the three chosen Case Studies, their comparison and analysis, and at last the final Discussion and Conclusions.

The problem Formulation focusses in four lines of analysis: the current general situation of the brownfields phenomenon in Spain, the explanation of the figure of the factors of success, the possible convergences and divergences that may exist between brownfield cases with different status of redevelopment and finally how the potential findings can influence future perspectives of the phenomenon in Spain.

Aalborg University Copenhagen

A.C. Meyers Vænge 15

2450 Copenhagen SV



PREFACE

This Project has been carried out during the 4th Semester of the MSc in Land Management (LM). The basic idea that resumes its purpose, follow the principle of “Sustainable Land Management”, with the promotion of solutions environmentally friendly through the revitalization of a derelict land.

The referencing system follows the Chicago quoting method, distinguishing references by author and year of publication. Quotes have been written in italics. Figures and tables have been numbered, referenced and described below each of them.

The author would like to express his gratitude to those people that in a way or another have helped to carry out this project, especially family, friends and supervisor for their help and patience; also those specialists that have been contacted for the interviews, adding crucial points of view about the different brownfield cases in Murcia, Andalucía and Asturias.

Thank you.

J. Daniel González Carmena



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1. Section 1

1.1 INTRODUCTION

The Brownfields phenomenon has a clear aim in the creation of initiatives of revitalization and redevelopment for contaminated/abandoned/derelict areas. Its heterogeneity in Europe has originated a complex conceptual framework with: an unclear scale of the phenomenon, a huge variety of interpretations and initiatives, a lack of standards and finally the no existence of a specific and clear legal framework that would control, register and state a range of criteria and guidelines for cases all along the EU members.

With this supra-national context, the country member of the EU, Spain, presents a context where there exist even more gaps related with the brownfields phenomenon, due partly to these European conflicts and partly to its own territorial, structural and political context. There is no use of the term "*brownfield*" as such or specific regulations or mentions of the phenomenon itself. On the other hand the soil contamination is present in the Spanish regulations, but with a no clear idea of the scale of the phenomenon, and this fact has created a range of negative consequences (lack of a legal framework, availability of information action-oriented, etc.). In addition each region has mainly its own competences for management, cleaning and recovery of contaminated soils. With this context of uncertainty and complexity, the initiatives of revitalization of a brownfield in Spain are not very numerous and very complex, with long processes of negotiation between the stakeholders, bureaucratic delays, lack of political will, urbanistic corruption, opposed interests, lack of concern regarding cultural and natural heritage, among others.

The objective that pursues the redevelopment of brownfields, implied in the term itself, is the statement of initiatives of revitalization of a specific deprived area. With the previously mentioned list of some of the characteristic gaps in Spain, these number of initiatives are not very extended. Moreover, the number of cases with some importance that have been successfully solved, are very limited. Consequently it is necessary to focus in those elements or factors that characterized successful cases of redevelopment and revitalization of a brownfield: **Success factors**.

The existence of brownfields are due to different causal factors: origin, land use, land transaction, level of contamination, drivers of redevelopment, barriers for redevelopment, stakeholders interaction, political will, etc. This paper aims to compare the causal factors of two/three Case Studies with different status (in terms of results) in the Spanish territory. For that, on one hand there is going to be used an unresolved and unsuccessful case, already

analyzed by the author (González Carmena, 2016): the Case Study in the region of Murcia (from now referred as PSMIII, Project Semester III). Primarily, the Bay of Portmán, as an example of an unresolved big scale case that have last for more than 30 years with no solution yet. Then, a Case Study in the region of Andalucía, where a chemical factory has been responsible for the contamination of the confluence of two rivers, close to the city of Huelva and where due to the pressure of ecologic and social collectives, there has been approved a plan of restoration. At last, a Case Study in the region of Asturias where there has been a huge environmental and landscape restoration in a region with an old and intense mining tradition. With this comparison of causal factors it is aimed to obtain some convergences and divergences that may help to underline some of the main necessary factors for a successful redevelopment of a brownfield, using them as a source of inspiration for future potential projects.

1.2 BROWNFIELDS PHENOMENON

This chapter aims to explain the main terms, gaps and justifications of the choice of this phenomenon and the subsequent topic for this paper. It displays the following sub-sections: first **(sub-chapter 1.2.1)** the framework that defines the phenomenon, then a brief description and pre-analysis **(sub-chapter 1.2.2)** of the existing scale and nature in Europe plus brownfield's conceptual framework (Origin, Scale, Definition and Classification) in the U.S., Europe and Spain, following with the description and pre-analysis of the current characteristics of the brownfields phenomenon in Spain **(sub-chapter 1.2.3)** and at last, the explanation and justification **(sub-chapter 1.2.4)** of the emphasis in this thesis of the phenomenon under interest.

1.2.1 Framework that defines the phenomenon

The choice of the brownfields phenomenon for this paper follows the same initial statements developed in the project PSMIII, where a common aim, highlighted and promoted in the recent years by European supra-national entities and inter-city networks (NICOLE, CLARINET, CABERNET, BRING-UP, etc.) through terms such as "*Life cycle of land*", "*Urban regeneration*", "*Revitalization of degraded areas*", "*Sustainable Development*", "*Saving Land Resources*" and "*Sustainable Land Management*" (European Commission, 2016) have arisen in terms of initiatives, projects, concerns and collaborations. This new tendency, opposed to the use of '**Greenfields**' (DeSousa, 2005) is committed to the re-use of abandoned, contaminated and underused scenarios, instead of building in natural areas,

and presenting in consequence several advantages. Even if the original aim has a clear “*sustainable stamp*”, in practice the tendency is sometimes to develop and promote projects that answer other’s interests, and even more in countries like Spain, where there is still an important gap in terms of legislative, legal and action-oriented tools framework, with a recent context of uncontrolled construction examples all along the territory.

It is important to remind when the term ‘**Brownfield**’ was originated (not the origin of the phenomenon itself, being explained later): “*The term brownfield is originated in the early 1990s when practitioners and researchers saw how emerging regulatory frameworks designed to protect the environment where, as a side effect, inhibiting the reuse, cleanup, and redevelopment of former industrial and commercial sites. These brownfield visionaries re-conceptualized vacant lots and abandoned properties; they invented a new term, brownfield, to express both the challenges and opportunities that such sites offered*” (Hollander et al., 2010; pp. 1). In other words, this term implies (and the subsequent phenomenon) the transformation of a concrete piece of land from a negative context to a positive one, not just for the land itself, but also for all the actors and features that participate actively or passively in this area and its surroundings. The aforementioned transformation is completed through mechanisms and tools of implementation, restoration, recovery and redevelopment.

Brownfields redevelopment pursue “*the promotion of Sustainability through Land Management*” (González Carmena, 2016) and all the necessary disciplines and fields to recover a specific site for the use respecting site-scale conditions such as environment and local stakeholder’s priorities. Nevertheless, the context of brownfields is directly related with the land management and spatial planning of a specific area, the phenomenon goes further, recognized and documented by the OECD (1998), in this way “*the presence of brownfields has adverse effects not only on the environment, but also on the economic and social health of a region*” (CLARINET, 2002; pp. 3). Moreover, to fix appropriately the influence and consequences that brownfields redevelopment cause, it is necessary to underline the opposite phenomena that can arise if a certain idled land is not invested for any improvement or process of recovery: ‘**Land Degradation**’, responsible of negative consequences that directly impact negatively on the environment, biodiversity and society, in urban, rural and mixed environments; also ‘**Shrinking Cities**’, for urban contexts, are another negative consequence, product of accelerated demographic changes, that are putting into debate the model of the European compact cities (BRING-UP).

Other issues that are necessary to be highlighted, directly related with this phenomenon, are the terms “**Cultural Heritage**” and “**Natural Heritage**”, very important factors according the CLARINET network: “*Many brownfield sites include old industrial buildings,*

which require maintenance under the special aspect of preserving the cultural heritage” (CLARINET, 2002; pp. 61). The cultural and natural heritage respond to those existing natural and non-natural elements merged into the local identity of a specific area during a concrete period of time, creating a connection between human beings and their environment, basic need for each individual (Yilmaz, 2011). The preservation and protection of the natural heritage follows two directions: first through the process of cleaning up of a contaminated area and through the development of integrated projects of revitalization, taking into account the natural landscape that surrounds the affected area and protecting it from harmful projects of revitalization for the environment. In relation with the cultural heritage, it has even more weight in a country like Spain, where the variety of scenarios, cultures, traditions, activities and environments make it crucial to preserve and maintain for the local identity of the communities affected by the potential brownfield.

1.2.2 General Conceptual framework

As it is said in the Introduction of this paper, the brownfields phenomenon and its inconsistency in terms of a common framework in a supra-national level, provoked the establishment of substantial differences regarding its notions and interpretations. Brownfields have been already studied and analyzed by different authors and agencies as well as this author in the project *“Investigation of the Brownfields phenomenon: Case Study: The Bay of Portmán in the region of Murcia”* (see project PSM III), where all its conceptual framework (origin, dynamics, typologies and definition) and legal framework (regulations at different scale) have been explained and described, obtaining a context of variety and differences among the different European countries and the U.S. It is true that among the U.S. there exists a more context of homogeneity regarding the conceptual framework of the phenomenon, being the EPA the responsible entity (US Environmental Protection Agency), but along Europe, every country differs (as well as coincides in some cases) at some extent with the others regarding one or more elements of the brownfields framework. This range of variety exists in relation with the terms used, interpretations made, priorities done, initiatives promoted and projects of redevelopment achieved. This atmosphere of differences and complexity, apart of having created an unstable paradigm for scientific research, it has originated also different action-oriented consequences in the European country members, varying in accordance with the specific characteristic context and framework that exist in each country. It is also true that internetworks of cities and agencies in charge of brownfields in Europe are starting to promote, share, publish and collaborate

with each other, understanding this need of 'standardization' of the phenomenon and its elements and components through different projects. The collaboration between big cities and trending territories (UK, Ireland, Germany, Belgium, etc.) is well-known, but for those areas that are not under the footprint of big intercity flows, they have to provide contexts of implementation and development with less resources.

The following pre-analysis, will be developed from two different sources: first de European Environmental Agency (EEA) provides some data and charts, that through and easy visual way, show the extent and scale of the phenomenon in Europe; and then, the last project developed by the author (PSMIII, 2016), resumes the existing conceptual framework of the phenomenon, from brownfields networks such as CABERNET, CLARINET, NICOLE, BRING, etc. These two sources will provide a general picture, necessary to understand the existing context.

To comprehend part of the extent of the phenomenon in Europe, the two following figures show:

- First one, the different activities that caused brownfield throughout Europe, for those identified scenarios where the preliminary investigations have been achieved (in consequence, this chart would probably vary with a more concrete knowledge of the scale and nature of the existing number of cases), Source EEA. The main idea that can be obtained from that Figure is that almost $\frac{3}{4}$ of the number of scenarios identified are from industrial activities, what proves from which contexts the majority of brownfields come from.

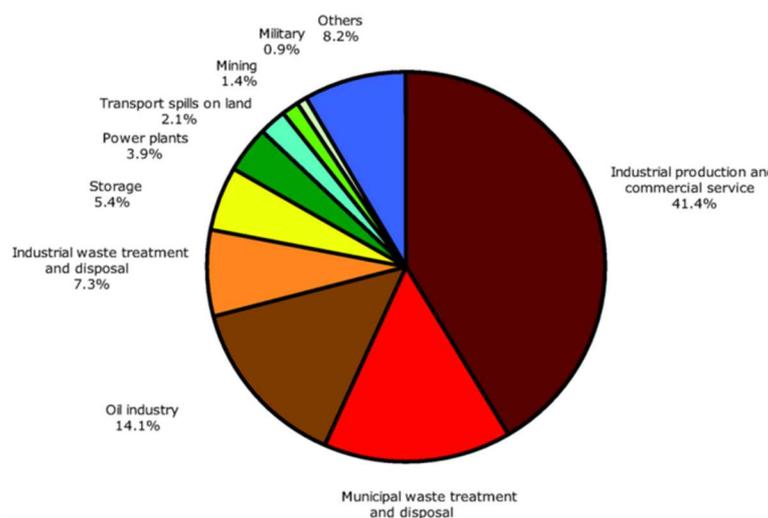


Figure 1. Chart of the activities that caused brownfield cases. Source EEA

- Second, the estimated progress in the management of contaminated sites in Europe, data from 2006 (needed to be multiplied x1000). Almost three millions of potentially contaminated activity sites. Showing the importance of the phenomenon and the large amount of brownfield cases across the continent (remembering that this estimated number is from 2006, and consequently assuming the EEA that this number is going to increase hugely by 2025, 50%, Source EEA).

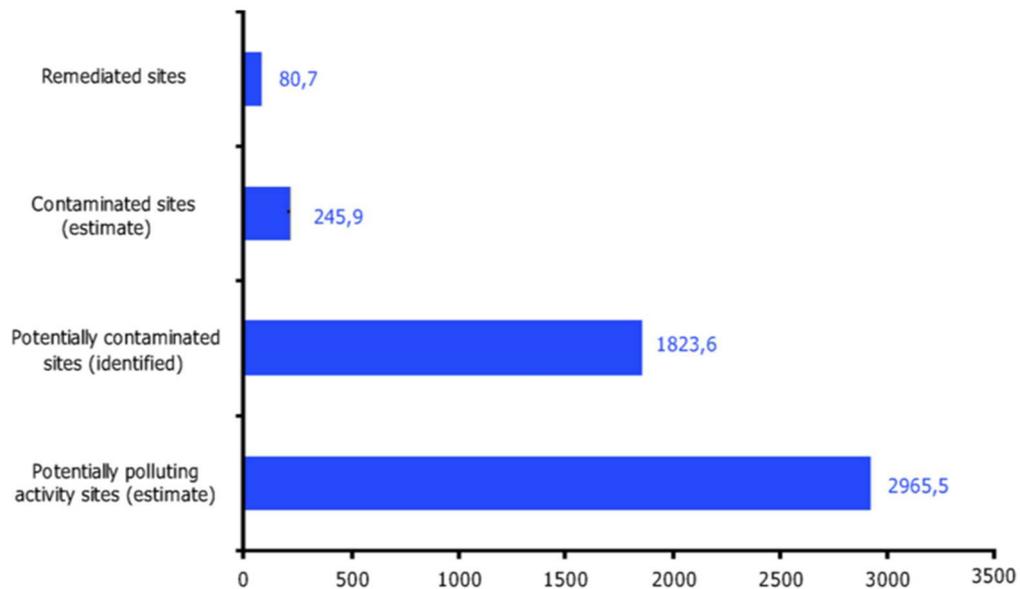


Figure 2. Estimated progress in the management of contaminated areas in Europe. Source EEA

The following tables will summarize the conceptual framework of brownfields appeared in the previous project written by this author through a desk based research (PSMIII, 2016) plus some extra information, to set up the subsequent differences that originated this context of complexity and highlight the elements that justify the achievement of the current paper. The brownfield concepts that are going to be listed shortly will be: **Origin, Scale, Definition** and **Classification**. Furthermore, for a better understanding of the existing gaps, there are going to be include also the point of view for brownfields in the U.S. (being traditionally a source of inspiration for European Countries, European examples that prove this diversity of notions, and finally the concrete information available from Spain about this conceptual framework, stating a small pre-analysis that is going to support the subsequent problem identification(chapter 2.1) and problem formulation (chapter 2.2) afterwards.

Table 1 BF origin U.S. & EU (own source)

Period	Origin U.S.	Origin EU
1980's	<ul style="list-style-type: none"> The decline in the industrial and manufacturing importance of the cities in the U.S. (Hudson, 1987 & Fischer, 2011) 	<ul style="list-style-type: none"> The closure of sites from the coal, steel and textile industries * (Eisen, 2002; BRING, 2010)
1990's	<ul style="list-style-type: none"> The phenomenon of migration and shifts of industries, moving to new open spaces or abroad (DeSousa, 2005 & Fischer, 2011) 	<ul style="list-style-type: none"> Military downsizing and abandoned transport infrastructures ** (BRING-UP, 2010)
21st century	<ul style="list-style-type: none"> The redistribution of population, commerce and industry from the big urban cores to the suburbs, after the end of World War II (Lang, 1982 & Fischer, 2011) 	<ul style="list-style-type: none"> Globalization and economic change originated brownfields and 'Grayfields' from social infrastructure, housing and commerce (BRING-UP, 2010)

Initial Statements

The origin of the brownfields in the U.S. and most of Europe coincides, having both areas experimented the same industrial revolution and the subsequent decline, social phenomena like migration, redistribution of population or refugees during the World War II (even if some difference in the timeline can exist). The western EU regions (traditionally industrial) have suffered approximately the same phenomena of social changes in the same period of time than the U.S., starting to be an important concern in both sides of the Atlantic Ocean since the 1980's (BRING-UP, 2010). Then, the central and eastern European countries that were incorporated to the EU, had to deal with these phenomena with a time lapse of 10 years, plus the exiting gap of the difference in terms of economic size, stability of political and social contexts, etc. that every European country has, creating an **unbalanced context of registration, initiatives and implementations along the continent, depending on multidisciplinary variables such as level of industrialization, competitiveness, population density, regulations in force, political will, etc.**

Table 2 of BF's Scale (*own source*)

Area	Number of BF	BF need remediation	Source Agency
U. S.	More than 450.000 sites	—	EPA
Europe	3.5 million sites approx.	500.000 sites	Vanheusden, 2007 & OECD, BRING-UP, CLARINET, CABERNET
Spain	18.000	4.900*	CLARINET, CABERNET & IHOBE

Initial Statements

Oliver et al. (2005) insist on the fact of this **lack of information available related to the scale of brownfields in Europe**; in this way, countries like Bulgaria, Greece, Hungary or the Slovak Republic don't even have any data at all, while other countries such as Denmark, Finland, Ireland, Spain Portugal, Italy and Sweden don't have an exact idea of the total area of brownfield land. But the present differences are not just in terms of information availability, but also in the complexity of the mechanisms of monitoring, resources and maturity of these systems. As an example, the mechanisms and systems developed in the UK won't have the same effect or footprint, efficiency and maturity then the really basic ones existing in Poland (BRING-UP, 2010), this unbalanced context regarding the precise knowledge of the scale is supposed to be one of the most important gaps in the brownfields phenomena in Europe. In addition, there is **no wide-EU inventory of the existing number of brownfields, no updated inventory in Spain** (PSMIII, 2016) which data is dated in 1995, when competences were transferred to the different regions (Autonomous Communities, CCAA), being responsible each CCAA to submit the information to the state, and consequently to the supra-national entities in charge to analyze and assess the different EU members in this field. *The only data available in terms of the brownfields scale in Spain was the one from the Basque Country (CABERNET, 2003), this means 1 region out of 17. Three of these 17 regions are understood as *'hotspots'* in number of existing brownfields, due to their traditional industrial and mining activities: Basque Country, Asturias and Cartagena in the region of Murcia (PSM III).

Table 3 of BF's Definition (*own source*)

Countries	Source Agency	Derelict, Underused, Abandoned,	Contaminated	Previously Developed	Need for Intervention
AUS	NICOLE				×
BEL	NICOLE		×	×	
BUL	NICOLE		×		
CZRP	NICOLE				×
DK	NICOLE		×		
ESP*	NICOLE		×		
EU **	CABERNET & CLARINET				×
FIN	NICOLE	×	×		
FR	NICOLE				×
GER	NICOLE			×	
IRL	NICOLE	×			
ITA	NICOLE		×		
LAT	NICOLE				×
POL	NICOLE		×		
ROM	NICOLE		×		
SLO	NICOLE	×			
SWE	NICOLE				×
UK	NICOLE	×		×	
U.S***	EPA		×		

Initial Statements

No common definition of brownfields in Europe even if the **contamination-related definition seems to be the most used**. Countries like Belgium or UK, have inside them different interpretations of the definition, contexts that again prove this complexity of notions. Different analysis have been done to try to group the interpretations of the definition of brownfields according to different patterns, for example (Oliver et al.). Of course the groups differ if the chosen patterns are different. What it is clear, is that the definition of brownfields is stipulated according to the land typology that is present. In relation with the **Spanish** definition of brownfields, it **has adopted** on one hand, **a specific definition for contaminated land** while other country members no (NICOLE), while on the other hand, the only available information from Spain along the different European

agencies in charge of brownfields is limited just to the region of the Basque Country again, where an official definition of brownfields exist.

Table 4 of BF's Classification & Typologies (*own source*)

Criteria	Source Agency	1 st Generation 1980's	2 nd Generation 1990's	3 rd Generation 2000's
• Original use	BRING-UP	Coal & Steel Industries	Military & Transport Infrastructure	'Grayfields'

Criteria	Source Agency	Category 'A'	Category 'B'	Category 'C'
• Economic A-B-C Model	CABERNET	Highly economically viable	Borderline of profitability	No conditions for profitable regeneration

Criteria	Source Agency	Typology 1	Typology 2	Typology 3	Typology 4
• Land Typology*	NICOLE	Contamination related	Dereliction related	Previous – use related	Requirement for intervention

Initial Statements

No existing classification that counts environmental, cultural or social factors in Europe. Need to state a framework that includes different criteria of classification in the same methodology of assessment with a certain '*standardization*' of the possible categories. The first criteria of classification showed in the tables insists on the original use of the land, separating three typologies that are **useful to identify of the period of time when that specific brownfield was originated, and the existing social, political and economic context** from these intervals; otherwise nothing in this classification states any typologies that imply future perspectives. So this classification can be understood as uncomplete to order comprehensively the typologies of brownfields. The second criteria that appears, discussed in the PSMIII (2016), shows a potential future perspective implied, but **prioritizing exclusively the economic criteria and parameters and dismissing other crucial ones** (Oliver et al.). It is one of the most used criteria in Europe, understanding the economic viability of an individual site as a major driver for brownfield regeneration

(PSMIII, CABERNET, BRING-UP). The direction of this classification would be appropriate, stating scenarios for redevelopment, but incomplete due to this lack of inclusion of other criteria that insist on more basis apart the economic one. The last criteria presented is related with the possible interpretations of the definition of the phenomenon. This categorization doesn't reflect directly future possibilities for the brownfield scenario under interest, but it reflects a possible framework of future actions depending on the land typology (and consequently physical characteristics) of that brownfield. The lack of a clear classification determines the consideration that every case of brownfield deserves.

With the basic conceptual framework of brownfields mentioned, and the statement of some of the most important gaps that shape the horizon of opportunities of the different European countries (more to those with less resources), the next sub-section will explain the current 'picture' of the brownfield context in Spain. This context, characterized by elements of uncertainty, void and lack of systematic control, is partly due to the inconsistent supra-national umbrella that covers the phenomenon. As a result of these conditions that are going to be explained below, the justification for the identification of factors of success is thoroughly accomplished.

1.2.3 Contextual Framework in Spain

Brownfields in Spain have a very particular context characterized by several gaps at different key actors, frameworks and regulations. As it has been insisted before in this paper, brownfields is a causal phenomenon, and to overcome brownfield scenarios, it is necessary the existence of **initiatives of revitalization**. For the accomplishment of these initiatives there can be needed three basic conditions: First a **clear legal and legislative frameworks (1)** at any level that shape the possibilities and limitations of action; second, the **availability of several canals, tools or mechanisms of information (2)** oriented to stakeholders and citizens, whose implication seems critical for an appropriate analysis and recovery of a derelict/contaminated land; third, **the availability of funding (3)**, that joining the clear frameworks previously mentioned plus the complicity of the stakeholders, will cover the expenses of the cleaning up and environmental recovery. Well, this three conditions doesn't exist in the Spanish context, added to the undefined supra-national framework previously mentioned as well, that emphasizes this idea of confusion and void, making difficult to assume any kind of systematization for the recovery of identified areas.

In relation with the first condition (legal and legislative frameworks), the current situation shows the existence of an **un-updated legislative framework** and **lack of a legal**

framework to control its application. The following table displays the most recent legislative tools in force that shape the current and existing legal framework in Spain related with soil contamination, being all of them (at every level), updated several times with no drastic changes. Consequently there is no need to list every update or new version of these regulations. The levels are supra-national and national (not including regional legislation from the regions where our Cases Studies are located, appearing later on in **Section 4**). With this table it is aimed to prove this lack of a holistic framework of regulations that would control, register and regulate appropriately the different cases of derelict, underused and contaminated land. It has been included in the table the last update of the European Directive related to waste management and soil contamination that the Spanish National Law 5/2013 transposes (repeating that there is no European Directive that attempts brownfields as such).

Table 5 of existing & updated Regulations for BF in Spain (own source)

Name	Level	Year	Type	Content
<ul style="list-style-type: none"> • Directive * 2010/75/EU 	European	2010	European Directive	<ul style="list-style-type: none"> • Updated version of different EU Directives (Recast) • On industrial emissions and integrated pollution prevention and control • 'Polluter pays' principle and Liability
<ul style="list-style-type: none"> • Law 5/2013 	National	2013	Law	<ul style="list-style-type: none"> • Modification and updating of the Laws "<i>Ley 22/2011: Waste and Contaminated Soils</i>" and "<i>Ley 16/2002: Integrated Prevention and Control of Contamination</i>" through new measures to accelerate administrative processes, protection of soil and underground water and expansion of the scope • Transposition of the Directive 2010/75/EU • Small updates in practice
<ul style="list-style-type: none"> • Law 22/2011 	National	2011	Law	<ul style="list-style-type: none"> • It is the one in charge of the current legislation and regulation management of contaminated soils; regulating two subjects: the general waste framework and its management, and the contaminated soils. • The basic legislation related with soil protection is developed in the RD 9/2005
<ul style="list-style-type: none"> • Royal Decree 9/2005 	National	2005	Regulations	<ul style="list-style-type: none"> • It establishes the relationship of potentially soil contamination activities and the criteria and standards for the declaration of contaminated soils • It regulates the previous L 5/2013, even though it was stated to regulate the previous and abolished L 22/2011
<ul style="list-style-type: none"> • State Framework Plan for Waste Management (PEMAR) 	National	(2016-2022)	National Plan	<ul style="list-style-type: none"> • The following part after the PNIR (National Integrated Waste Plan), in force until 2015. • Complying supra-national precepts • Objective: state a circular economy in Spain, instead of the current linear one • Environmental, Economic and social benefits associated with the pollutant's character • Aim of more compliance among the CCAAs
<ul style="list-style-type: none"> • National Inventory of Contaminated Soils 	National	1995	National Inventory	<ul style="list-style-type: none"> • Included as a part of the First National Plan of Contaminated Soil Recovery (1995-2005) • Diagnosis of the situation • Objectives and main lines of action to act against those contaminated places • Funding

In summary there is only a unique legislative tool in force, the Royal Decree RD 9/2005, that regulates specifically for contaminated soils in accordance with L 22/2011 (currently abolished) and L 5/2013 (the one in force that substituted the previous one). In this way, **the Law 5/2013 needs an updated list of regulations**, adapted to the current conditions. **It might not be appropriate to use an updated legislative framework but regulations with more than 10 years in force.**

The new National Plan (PEMAR), includes a specific section of the document regarding contaminated soils, stating in the first phrase: *“The protection of the soil against contamination lacks an EU unique reference regulation, while some Directives (...) introduce elements of protection against soil contamination, being incorporated to the national regulations (...)”* (MAGRAMA, 2015; pp. 171). **It is evident that there is missing a specific legislation regarding soil contamination at a supra-national level that conditions the national legislation of the Country Members.**

Related with the National Inventory, it has been already commented by this author in PSMIII (2016) that *“One important detail is the lack of an updated National Inventory of Contaminated Places, being the only one achieved in 1995 (BOE, 1995), year where the competencies of inventory were transferred to the Autonomous Communities (regions), that had the responsibility to complete their own inventories and then submit them (...) in a national scale”* (Quote González Carmena; pp. 30-31); in consequence, if 17 regions, with their own regional contexts, political parties ruling, conflicts going on and declared priorities, have to submit their own inventories, the consequence is that since 1995 there is no nation-wide updated inventory and that every region might be in a different status for the compliance of their respective inventories.

Regarding the second condition (tools), there is the **NO existence of a specific legislative tool** that assesses the phenomenon of brownfields as such. But the existence of tools of characterization so called *‘Informe de Situación’* (Status report) are required by the Autonomous Communities for the identification of potential contaminated areas, as well as *‘Informes Complementarios’* (Complementary reports).

Concerning the third condition (funding), the next chart shows the level of annual expenditure (% of GDP) of those country members with the available data for the management of contaminated soils (Source EEA). The chart shows that Spain is the country with less percentage of GDP used for the remediation of contaminated soils among the EU countries with available data.

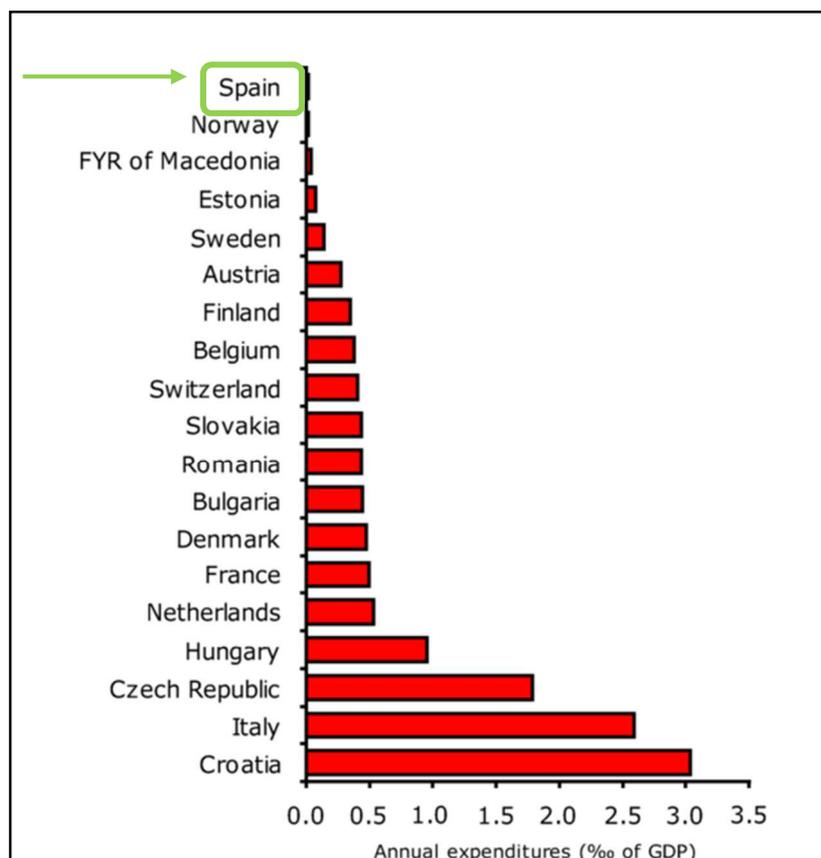


Figure 3. Level of annual expenditure (% of GDP)

Apart of these three basic conditions that are necessary for the statement and accomplishment of initiatives of revitalization, there are going to be underlined more characteristic gaps that embrace the brownfields phenomenon in the Spanish territory.

It is important to insist on the fact that in Spain there is **no existence and no use of the term 'brownfield' itself (4)**, but the Spanish regulations include the phenomenon of soil contamination and waste management, assuming consequently direct emphasis on contamination in the understanding of the brownfields phenomenon. Moreover, the **cases of soil contamination in the Spanish territory that have been attempted to be solved** and appeared in the media, were those that have been related with **big ecological disasters (5)**, due mainly to the mining and industrial activity (the case of Portmán or Aznalcóllar) or other singular accidents with oil tankers (El Prestige) in the waterfront in different parts of the country.



Figures 4, 5 & 6 of the Case of Aznalcóllar (Sevilla) Source: Junta de Andalucía (4) & El Mundo newspaper (5 & 6)



Figures 7, 8 & 9: Accident of the oil tank "El Prestige". Source: La Marea newspaper



Figures 9, 10 & 11 of the U.S military Planes accident in Palomares (Almería)

As it is stated in the Introduction, **the territorial context (6)** of Spain is very particular and complex. In summary there are three levels of Administration: Central (Ministries), Regional (Autonomous Communities, CCAAs) and Local (Municipalities). The Ministry of Agriculture, Food and Environment is the entity in charge to establish the basic legislation for soil contamination (respecting the transposition of the EU Directives) as well as the coordination of the CCAAs, having every CCAA the possibility to modify them, but respecting the established guidelines by the Ministry. In short, the CCAAs have the direct competencies for soil contamination. The next Figure displays the hierarchical structure in the field of soil contamination management, insisting on the fact that the interaction throughout the different levels of the pyramid (supra-national, national, regional and local) is two-ways: top-down and bottom-up.

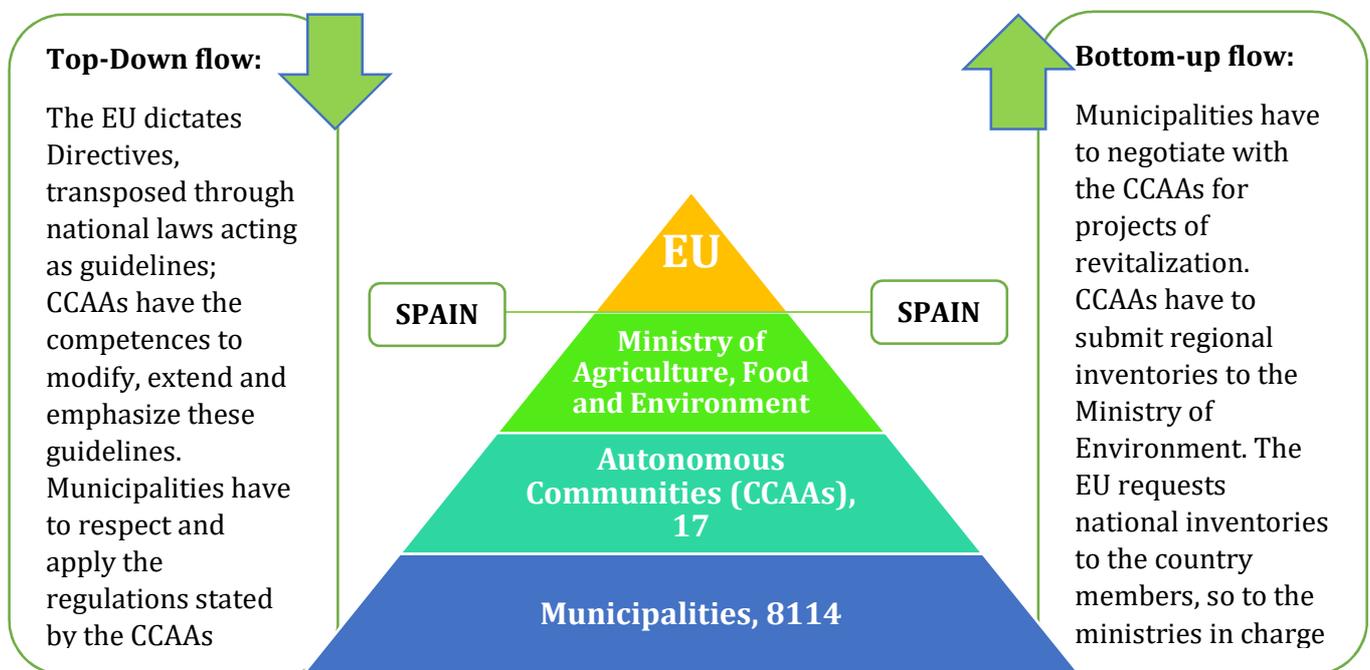


Figure 12. Spanish hierarchical structure regarding soil contamination management (own source)

With this figure is really easy to see that, if the first two levels are unclear and inefficient, the two levels below have a lack of criteria, control and guidelines, for an effective remediation of contaminated sites. This situation has favored one of the most important gaps that is limiting contexts of redevelopment of brownfields in Spain. Moreover, among the regional level, regions in Spain (Autonomous Communities) **have** in practice **all the competencies** (since 1995) regarding all those issues related with soil remediation and waste, provoking huge differences in terms of monitoring, objectives, priorities and initiatives between the regional circumscriptions, being each region ruled by different

political parties and creating a certain dependency of action with the political will (Examples; Lack of an updated National Inventory of Contaminated Places, since 1995 as well). This facts increased the complexity and differences between regions, urging to create similar **systematic tools of assessment and evaluation (7)** for all the regions, looking for accessible tools for public administration and implicated stakeholders.

More gaps identified are caused by this **only focus on contaminated sites (8)**, provoking that cases of brownfields abandoned, underused or derelict are not identified and registered, creating a complete barrier for their potential revitalization and reuse of the abandoned lands, lasting indefinitely without any attention.

According to the CABERNET network and also stated in the PSMIII (2016) *“The regions in which there is a significant presence of brownfield sites are those in which there has been development of industrial activity, specially related with the mining industry (...) The most extended areas are: Asturias, Cartagena and the Basque Country”* (CABERNET, 2003; pp.2). These three ‘hotspots’ are identified the European network (AST, BC and CA) in the next Figure.



Figure 13. Map of Spain with the location of the hotspots identified by CABERNET and the location of the three Case Studies. Source: SIGPac viewer

Two of these identified hotspots include two of our Case Studies: CS1, The bay of Portmán (CA) and CS3, The Nalón Valley (AST); the second one is located in the southwest coast of

Andalucía, in the region of Huelva, outside the hotspots, but in a sensitive area with plenty of chemical industry. The image above shows also the location of this three Case Studies.

1.2.4 Focus in the thesis of the phenomenon

After the previous sub-sections with the description and initial analysis of the phenomenon through its main general terms, purposes, conceptual framework in Europe and the U.S and the current picture of the phenomenon in Spain, this sub-section develops the emphasis of this paper in the phenomenon, previously summarized in sub-sections (**1.2.1, 1.2.2 and 1.2.3**).

This project is going to focus in the Spanish territory, due to different reasons: its closeness with the author, the access to data acquisition, familiarity with the different administrative structures, legal and legislative frameworks, the possibility of interviews with local specialists and the motivation to analyze a phenomenon in your own country, aiming also the author to continue the research and analysis of the brownfields phenomenon from the PSMIII (2016), in the Spanish context.

The chosen Case Studies have been selected as relevant milestones (positive and negative) of the brownfields phenomenon in Spain. First the **Case Study of Portmán** (see **sub-chapter 4.1.1**) shows how due to different conflicts and barriers, the contamination of a whole bay in the Mediterranean coast (being the worst case of heavy steel pollution in the history of the Mediterranean Sea) and consequently a relevant incident followed by the media, is still unresolved, after 30 years of negotiations, projects refused and political shifts. Secondly, the **Case Study of the Confluence of the Tinto and Odiel rivers** in the city of Huelva (see **sub-chapter 4.1.2**), exposes a case where there have been discharges of toxic residues from a chemical factory in one of the sides of the river, provoking the biggest dumping site of toxic and radioactive industrial residues of Europe, with a strong opposition from the local communities and an evident lack of political will from the local, regional and national Administrations. Thirdly the **Case of the Nalón Valley** (see **sub-chapter 4.1.3**), arises an exemplary case where, in an example of large scale contamination as a result of more than a century of coalmining activity, has being tackled with the compromise of the Administration at every level stating context of recovery through precepts of territorial cohesion, environmental restoration, put in value of the mining heritage and industrial transition.

As the Introduction initially stated, brownfields scenarios are the direct result of causal actions: industrial activity nowadays abandoned, contamination of an area due to different reasons, underused areas due to social changes, derelict infrastructures as a result of shifts in the economic interests, among others. Having clear this, it is also necessary to assume that their potential revitalization depends on a huge number of interconnected factors that provoke a context of complexity and uncertainty, when opposed interests exist. Among this factors, the specialized literature related with the phenomenon in Europe and the U.S. have divided them in two big categories: **Drivers** and **Barriers for redevelopment**, and other notions as well (see sub-chapter 3.1.1). Understanding drivers as key elements that are able, by themselves, to unblock a stuck case of brownfield; and referring as barriers to those elements that are necessary to overcome for the increase of possibilities of an appropriate redevelopment. Instead of this traditional two-folded grouping, this paper aims to state, among all the factors that shape the conditions of a specific brownfield and its process of improvement, a **focused action-oriented perspective**, with the highlighting of the factors that were responsible for the successful achievement of the recovery of a brownfield site, or at least factors that opened a context of recovery as initial and necessary steps, even if this successful recovery was not completely achieved. This approach is stated as a result of the lack of systematization of brownfield cases attempted and solved successfully in Spain due to the reasons mentioned in the previous sub-chapter, fact that makes difficult to identify the traditional categories of drivers and barriers, varying this categorization from one scenario to another (a 'driver' in a scenario can stay as a 'barrier' in another). Consequently it would be necessary first to identify these main **Factors of Success** (see chapter 3.1) through a simple qualitative comparison of existing cases studies (see chapter 4.2) in different areas of the country, so assuming the territorial complexity, and then, try to use the possible convergences and divergences to underline these factors for future perspectives in the remediation of brownfields in the Spanish territory (see chapters 5.1 & 5.2).

2. Section 2

2.1 PROBLEM IDENTIFICATION

This chapter aims to stress on the different existing gaps that are currently present first in the conceptual framework of the phenomenon in a more general and supra-national point of view (from **sub-chapter 1.2.2**) through the first table and then with the characteristic gaps that shape the brownfields context in Spain (from **sub-chapter 1.2.3**) through the second one, and how these gaps have originated a lack of interventions and initiatives to remediate cases of soil contamination or derelict land. This top-down flow, from supra-national contexts to national and regional levels, lead the reader through a coherent process that helps to understand how in a hierarchical order, the efficiency of each level depends on the upper one and so on. This highlighting will identify the different issues that are under concern for the purpose of this thesis, as the previous step for the problem formulation of the paper (**chapter 2.3**) afterwards.

All those initial statements that have been included in the following table, may not be directly used for the problem formulation, but it is intended to show the different possible perspectives of analysis and research that exist related with brownfields, in Europe as well as in Spain, being very numerous.

Table with initial statements and pre-analysis of the existing gaps in Europe and the conceptual framework

Table 5. Issues and Gaps identified in sub- chapter 1.2.2 (own source)	
✓	The main objective of the revitalization of a brownfield is to recover a specific piece of land through precepts of Sustainable Land Management, Saving Land Resources, evite Land Degradation, etc. but how realistic are these precepts when there are in practice opposed interests in the process of redevelopment?
✓	If the revitalization of a specific brownfield is achieved through tools and mechanisms of different nature, does exist any systematic tool that has been proved as effective for the appropriate monitoring, control or improvement of a brownfield?
✓	If the importance of the existence of a brownfield seems to be obvious according to all the specialized entities, with direct and indirect impacts in all the actors and components of a concrete region, why is it still confusing its most basic conceptual framework?
✓	What are the action-oriented, informative and political consequences of an instable conceptual framework for a Country Member of the EU?
✓	Inter-city and inter-region networks of action and cooperation are necessary, but what about those areas outside their footprint? Equality of opportunities?
✓	The origin of brownfields coincides all along Europe, but there is present an unbalanced context of revitalization depending on multidisciplinary economic, political and social patterns and variables
✓	There is no exact idea of the scale of the brownfields phenomenon in Europe, neither the level of maturity and effectiveness of the existing tools necessary to monitor and remediate them
✓	No common definition of brownfields in Europe, but all of them follow the criteria of the typology of land
✓	The existing classification of brownfields tend to avoid environmental, cultural or social factors and dismiss the inclusion of future perspectives, with an obvious emphasis in the economic criteria

Table with characteristic gaps of the BF phenomenon in Spain

Table 6. Issues and Gaps identified in chapter 1.2.3 (<i>own source</i>)	
✓	There is no legal framework that punish and control cases of soil contamination, consequently no entity in charge to the respect of the application of the legislation. Legal void?
✓	There is an un-updated legislative framework, with un-updated national inventories of contaminated areas, having transferred the majority of the competencies to the CCAAs and having each of them a different range of delays, interests and political parties ruling the region.
✓	In Spain, the lack of funding is present, with the public administrations very limited and lack of private investors that pursue the objective of brownfields recovery with integrated concern of the local contexts.
✓	The no availability of tools, mechanisms and canals of information or assessment/evaluation that would implicate local stakeholders and help potential processes of negotiation. Then there is no public concern of the phenomenon, and resolutions of cases depend on others interests.
✓	The no use of the term 'brownfield', but the consideration of soil contamination. What happen if a specific area is not polluted but still derelict, underused and in the need of revitalization?
✓	In Spain is possible to affirm that there is no 'brownfields culture' having just attempted to solve relevant cases that were big ecological disasters and promoted by the media, and concerning public opinion. The majority of those cases came from the mining industry. There is a need to learn from the experience of successful cases.
✓	The complexity of the territorial context gives to Spain a climate of inconsistency, added to the incomplete supra-national context already mentioned. This complexity is due mainly to the politicians that rule each region, differing from one region to another (or not) and sometimes differing from the national government, what gives an unbalanced list of priorities moving from one region to the others. A case of brownfield can be interpreted differently from one region to another.

The previous two tables displayed a list of statements and facts with several questions and gaps that might be need to be answered. Having the existing supra-national context for brownfields plus the national one in Spain, it is easy to detect how difficult can be to create contexts of systematization of brownfields in terms of identification and remediation. These evidences have a real impact in the local/site level (municipalities) lacking all the necessary frameworks and tools of assessment, control, monitoring, regulating and punishing, in short, it has **direct action-oriented consequences**. The next Figure will show the possible outcomes of the existing context through the necessary hierarchical structure.

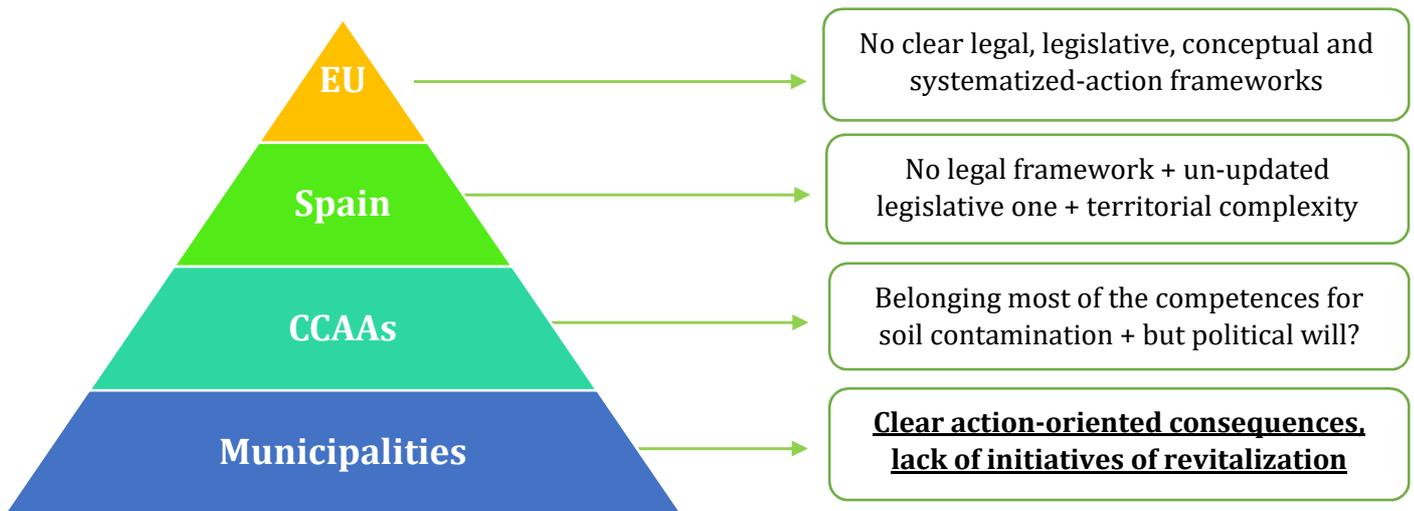


Figure 14. Possible outcome of brownfields in Spain (own source)

With these two contexts (supra-national and national) of lack of standards plus the uncertain regional one existing in Spain, it is necessary to state perspectives for the success of cases of contamination in a site-level. First, it is necessary to assume that the existing national and supra-national frameworks condition the possibilities of successful processes of recovery for brownfields. Then, the determination of these factors of success (to tackle with a bottom-up perspective cases of contaminated and derelict land) have to be obtained through the identification and comparison of factors/attributes and their indicators in different Case Studies, located in different regions of the Spanish geography. In this way, with this inter-regional comparison of Case Studies, it is aimed to find elements of convergence and divergence, for the identification of the main drivers that may provoke a partial or total success in the process of recovery and remediation of a brownfield, and starting in this way, through a bottom – up or inductive approach, the construction of an appropriate and systematized framework of action that may cover the gaps originated in the upper levels.

Having clear the nature and origin of some of the different existing problems related with brownfields, **chapter 2.3** will state the problem formulation of this project, based on the perspectives and ideas arisen in the pre-analysis of **chapter 1.2** and the identification of the several subsequent problems from the current chapter.

2.2 PROBLEM FORMULATION

The identification of the different gaps and conflicts in **chapter 1.2** and the need for action-oriented solutions, identified in **chapter 2.1**, made the foundation for the following problem formulation, based on a general question that embraces four sub-questions. The reasoning of this statement of the problem formulation has followed first a top-down process (in terms of administration levels) across the brownfields phenomenon from a holistic picture of some of the important notions, going narrower into a specific country and its characteristic conditions (Spain), narrowing down into the preparation of a site-level analysis through the choice of three Case Studies and the subsequent comparison (**chapter 4.2**).

This problem formulation, as it has been repeated several times in this paper, states the possibility of identification of success factors that can provide elements of consensus for future practices in brownfields scenarios in Spain:

- ❖ **Which are the possible success factors that strength the process of revitalization of brownfield cases in Spain?**
 - a) **What is the current 'picture' of the brownfields phenomenon in Spain?**
 - b) **What is understood as a 'success factor'?**
 - c) **What are the coincidences and differences between an unresolved case of brownfield and a successful one?**
 - d) **How can the previous statements influence future perspectives of the brownfields phenomenon in Spain?**

The main question of the problem formulation embraces the four following sub-questions through a linear order among them: **sub-question (a)** describes the contextual framework of the brownfields phenomenon in Spain in terms of scale, regulations in force, legal framework, etc. to understand how is approximately the current national conditions related with the management of soil contamination (see **sub-chapter 1.2.3**); **sub-question (b)** develops a conceptual – analytical framework where it is explained what is understood as a factor of success, the reason of using them and the possible different categories where to allocate those factors (see **chapter 3.1**); then **sub-question (c)** explores this mainly qualitative comparison (chapter 4.2) between the three chosen Case Studies (previously portrayed in **sub-chapters 4.1.1, 4.1.2 and 4.1.3** respectively) across the Spanish geography that shaped the level of success or failure of those brownfield cases; and at last, **sub-question (d)** will discuss as a result of this comparison (see **chapter 5.1**), the subsequent findings from it and future statements of the brownfields phenomenon in Spain. The following figure displays the logical structure of the current problem formulation all along this paper:

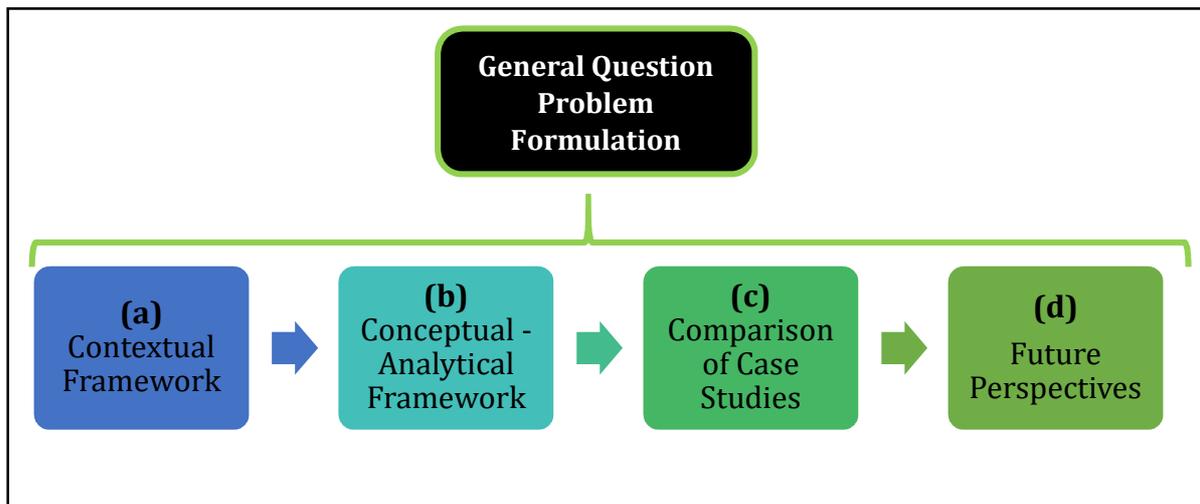


Figure 15. Logical structure of the Problem Formulation

The Figure below shows the schema of the Problem Formulation and its connection between each sub-question stated with the different chapters and sub-chapters that this paper contains:

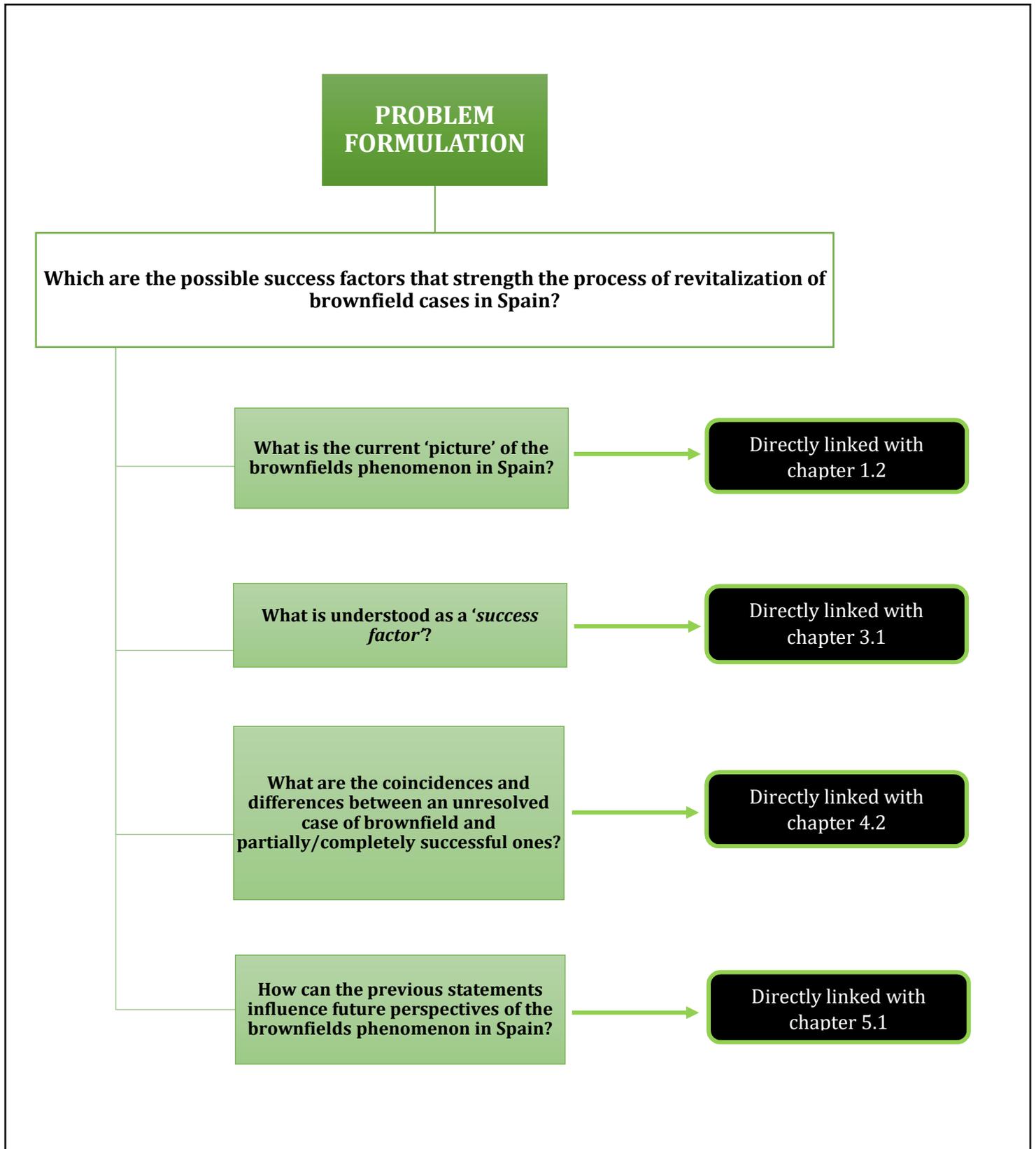


Figure 16. Problem Formulation and its link with the chapters of the project (own source)

2.3 METHODOLOGY

2.3.1 Project Structure

Regarding the structure of this paper, it is divided in the following five different sections:

- **'Section 1'** includes the Introduction and justification of the choice of the brownfields phenomenon with the different conflicts that have arisen from it (**chapter 1.1**), as well as an initial background description (**chapter 1.2**) with the summary of the main notions and terms that shape the brownfield phenomenon.
- **'Section 2'** displays first the identification of the problem (**chapter 2.1**) among the different gaps identified in the previous chapter, then the explanation of the methodological approach, through the structure of the project (the current sub-chapter, **2.2.1**), research methodologies followed, sources of evidence used and their criticism and finally the use of data and its validity and reliability (sub-chapters **2.2.2**, **2.2.3** and **2.2.4** respectively) applied to carry out this Thesis, finally **chapter 2.3** states the subsequent elaboration of the problem formulation, that is going to present one general query and four sub-questions, shaping the flow and content of the paper.
- Following with **'Section 3'** that will point out, through a conceptual-analytical framework, the methodology of analysis, its transposition to the brownfields phenomenon and the *"a priori"* selection of indicative factors that are going to be used in the different Case Studies later on.
- In **'Section 4'**, **chapter 4.1** justifies the selection of indicative qualitative and qualitative indicators which affects are going to be identified throughout the three chosen Case Studies, with their subsequent description (**sub-chapters 4.1.1**, **4.1.2** and **4.1.3**), then **chapter 4.2** will compare the effects of the selected factors looking for patterns among the different indicators. **Chapter 4.3** will analyze the findings from this comparison, identifying the factors of success arisen from the evidences of the three cases.
- Finally **'Section 5'** contains the final discussion the will summarize the previous findings and the future perspectives underneath (**sub-chapter 5.1**) and at last the final conclusions answering the problem formulation (**sub-chapter 5.2**).

2.3.2 Research Methods

The current sub-section explains the justification and use of **Descriptive and Normative research** and the use of the **Case Study** as most appropriate methods for this paper. Throughout the explanation there are going to be showed some tables that will clarify the link between the Research Methods applied and the Problem Formulation or the general structure of the project.

J. Kuada affirms that the Descriptive Method provides a clear picture of the issues investigated, exposing “(...) *what is happening, how is happening and what is expected to happen in the future, based on what we know today*” (2012; pp. 42) whereas the Normative Method provides an outline for decision-making applied to “(...) *what a rational decision maker should do under identified conditions in order to attain a given objective*” (2012; pp. 43).

Primarily, this project has supposed a desk based research of the conceptual framework of the brownfields phenomenon (**Chapter 1.2**), and the different selected brownfield scenarios (**Chapter 4.1**). All along this process there has been achieved both Descriptive and Normative research methods, including this character of description and decision-making in the general question of the Problem Formulation. Clearly, **Section 1** provides an emphasis that is more Descriptive than Normative, taking into account that the purpose of the project is a Comparative Analysis between three real world cases. **Section 3** adds a conceptual-analytical framework necessary for the subsequent comparison between the three brownfield scenarios. Then **Section 4** has first a clear descriptive aim of the characteristics from each of the three scenarios, the project proposed to overcome the negative context and the identification of drivers and barriers for redevelopment based on the evidences. After the comparative analysis among the three cases and the identification of the factors of success follows, **Section 5**, which discusses the findings from the previous comparison, describing them and stating future opportunities based on decision making contexts (so providing descriptive and normative content as well).

The table below underlines the Descriptive or Normative purpose that each of the questions of the Problem Formulation pretends:

PROBLEM FORMULATION	CONTENT	RESEARCH CHARACTER
• General question	• Which are the possible success factors that strength the process of revitalization of brownfield cases in Spain?	Descriptive & Normative
• Sub-question (a)	• What is the current 'picture' of the brownfields phenomenon in Spain?	Descriptive
• Sub-question (b)	• What is understood as a 'success factor'?	Conceptual – Analytical
• Sub-question (c)	• What are the coincidences and differences between an unresolved case of brownfield and partially/completely successful ones?	Analysis Comparison
• Sub-question (d)	• How can the previous statements influence future perspectives of the brownfields phenomenon in Spain?	Descriptive & Normative (based on findings)

Table 7. Link Problem Formulation – Research character (own source)

Regarding the use of methods, the present project develops a methodology of research based on three 'real world cases' or Case Studies, three brownfield scenarios in three different areas of Spain. For a phenomenon with direct causes and consequences in the territory as well as social, environmental, economic and political factors as brownfield embraces, the use of the figure of the Case Study might be the most adequate option to choose as research method. Looking to the other possible research options such as **Archival Analysis, Experiment, History** and **Survey**, they seem to provide a particular research question that doesn't exactly fit with the type of questions stated in the Problem Formulation (see **Chapter 2.2**). First, the Archival Analysis is related with the research question "What?" and consequently proposing a context of exploration and survey (Yin, 2014), being true that the already stated problem formulation contains three sub-questions of this kind, but related with the **Pre-Analysis** of the phenomenon and the explanation of the figure of the **Factors of Success**. Then the research type known as Experiment requires basically the control of behavioral events (Yin, 2014) when is not the case (brownfields are cause-effect scenarios). Finally, the use of History as the research method, forces to focus exclusively on past events (Yin, 2014), and even if it is true that among the Case Studies there is a tendency of a retrospective approach to understand and explain current conditions, the research is based on the current characterization of the scenarios and the planning and execution of the new uses for the brownfield under concern.

In conclusion, the Case Study method, based on the “How?” and “Why?” questions, seems to fit properly with the stated research framework, and being the general question of the problem formulation. Using R. Yin words: “A Case Study investigates a contemporary phenomenon and its real world context, especially when the boundaries between phenomenon and context may not be clearly evident” (2014; pp. 2), adding that a Case Study “(...) allows investigators to focus on a ‘cases’ and retain a holistic and real-world perspective” (2014; pp. 4). **So it is evident that the choice of the Case Study as the Research Method for this paper is the most suitable option for the phenomenon under analysis, the statement of the problem formulation and the purpose of the paper through the comparison of three real world cases.**

The following table displays the link between the problem formulation and the Case Studies, being all the questions directly or indirectly related with them, proving this permanent link between the content of the project and the different question stated in the previous chapter:

PROBLEM FORMULATION	CONTENT	LINK WITH CASE STUDY?
• General question	• Which are the possible success factors that strength the process of revitalization of brownfield cases in Spain?	Direct link
• Sub-question (a)	• What is the current ‘picture’ of the brownfields phenomenon in Spain?	Indirect link
• Sub-question (b)	• What is understood as a ‘success factor’?	Indirect link
• Sub-question (c)	• What are the coincidences and differences between an unresolved case of brownfield and partially/completely successful ones?	Direct link
• Sub-question (d)	• How can the previous statements influence future perspectives of the brownfields phenomenon in Spain?	Direct link

Table 8. Link Problem formulation – Case Study

2.3.3 Sources of Evidence & Source Criticism

The sources of evidence come from different relevant literature, reports from agencies in charge of brownfields redevelopment, local literature plus academic and technical reports regarding the different selected brownfield scenarios, regional geographic viewers from each of the Spanish regions where the real world cases are located and also structured interviews with local specialists from each of the three areas under concern. In overall sources of evidence with a valid and reliable character.

The next table summarizes the use of the sources of evidence among the different sections of the project.

SECTION	Combination of Sources of Evidence used
<ul style="list-style-type: none"> Section 1 	<ul style="list-style-type: none"> Reports from specialized supra-national agencies and brownfield networks, European Conferences, relevant brownfield literature and semi-structured interviews with supra-national specialists. Regarding Spanish sources of evidences, related regulations, laws and multi-scale plans and inventories, information from the Ministries, media and the last project developed by this author.
<ul style="list-style-type: none"> Section 2 	<ul style="list-style-type: none"> Relevant Literature regarding research methodologies
<ul style="list-style-type: none"> Section 3 	<ul style="list-style-type: none"> Relevant literature regarding territorial analysis methods, supra-national agencies and brownfield networks, relevant literature related with causal factors and their indicators
<ul style="list-style-type: none"> Section 4 	<ul style="list-style-type: none"> Semi-structured interviews to local specialists from each of the areas of the Case Studies, mentions from the last project developed by the author in CS1. Relevant local literature and technical reports from local authors and local universities in the areas of different brownfield cases, regulations from local to supra-national level, relevant cartography and aerial images, and geographic information from regional and national geo-portals
<ul style="list-style-type: none"> Section 5 	<ul style="list-style-type: none"> Relevant literature of related theories with the findings reached

Table 9. Sources of evidence used in each section of the project (own source)

The conduction of **semi-structured interviews with different specialists** (at least one for each Case Study) and specialists in a European level, needed for the holistic picture of the brownfields phenomenon in an overall perspective. Some of these interviews have been achieved in English and others in Spanish. The contact with a local specialist for each of the real world cases in Spain, all of them providing valid and reliable testimonies and a basis for the statement of the case and its subsequent development. Also, the point of view of the supra-national specialists exposed a valid and reliable of the holistic picture of the phenomenon. The structure of the interviews as well as the complete profile of the specialists are included in the project as annexes: Annex A for Interviews in Spanish and Annex B for Interviews in English. The following list shows the specialists contacted:

- **Ana Paya-Pérez** (European Commission): Brownfields phenomenon in Europe and in Spain, verbal and written semi—structured interview.
- **Xianuo Li** (University of Brighton): Brownfields phenomenon in Europe, written semi-structured interview
- **Gregorio García** (Universidad Politécnica de Cartagena): Case Study 1 of the Bay of Portmán (Murcia), written semi-structured interview.
- **Rafael García Tenorio** (University of Sevilla): Case Study 2 of the Confluence of the Tinto and Odiel Rivers (province of Huelva, region of Andalucía), spoken semi-structured interview.
- **Manuel Hernández Muñiz** (University of Oviedo): Case Study 3 of the Nalón Valley (region of Asturias), spoken semi-structured interview.

In relation with the **Source Criticism**, it is needed the construction of validity and reliability (Yin, 2014) to judge appropriately the quality of the sources of evidence and consequently the research framework. **The construction of validity** is based in the identification of correct operational measures for the phenomenon and concepts being studied and analyzed (Yin, 2014), how? Through the use of multiple sources of evidence, establishing a chain of evidence and having also key informants (Ying, 2014). **The construction of reliability** is the demonstration that the process and operations accomplished of a study such as the data collection procedures, are able to be repeated with the same results (Ying, 2014).

The construction of validity is effective in this project with the inclusion of a wide range of multi-nature sources of evidence at all levels, from relevant literature until official information from the Administration (at every level as well). Then, the construction of

reliability is effectively included as well, due to the fact that all the research and data information (that has not being measured or collected directly “*in situ*” by the author) but has been identified, collected and summarized from other reliable, relevant and specialized sources already mentioned previously in this sub-section.

2.3.4 Analysis Methods and use of data

The analytical framework is justified, referred, explained and developed in **Section 3**. All along that part it is achieved a **Comparative Analysis** of mainly qualitative but also quantitative evidences of the three selected Case Studies, based on the transposition of a relevant methodology (Gómez Orea, 2007) with the phenomenon under concern. In this way, they can be underlined the factors of success (if present), stating possible key factors and underline their role and importance for process of restoration and recovery of the brownfield scenarios.

At last, regarding the use of qualitative and quantitative methods of data collection throughout the analysis and comparison of the obtained data, it can be consider that the current project makes use of the so-called **Mixed Methods** (Kuada, 2012) **mainly qualitative data but also quantitative**, combining the two options to provide a better input and insight of the problem formulation and its resolution. Strauss and Corbin define the qualitative research as the research that produces findings without the use of any statistical procedure or other possibility of quantification (Kuada, 2012), through the techniques of semi-structured qualitative interviews, qualitative research of information from valid and reliable sources and consequent qualitative comparison of the cases. Regarding the quantitative data collection approach, the researcher considers the object of investigation as an entity with one or more variables (Kuada, 2012), using some countable data for those identified variables (in this case quantitative indicators depending on previously selected factors (see **Sections 3 & 4**) as well as quantitative research of information from valid and reliable sources of evidences.

Section 3

3.1 IDENTIFICATION OF FACTORS OF SUCCESS, DRIVERS AND BARRIERS

Continuing with the statements displayed in sub-chapter 1.2.4, the current chapter proposes a conceptual – analytical framework based on the notion of **Factors of Success, drivers and barriers** and the partial transposition of the OT methodology that is going to be used for the following Case Studies comparison (chapter 4.2).

As it is mentioned several times, the last aim of this paper is the promotion of initiatives of revitalization (direct action-oriented objective), that would be achieved through tools such as Plans or projects of redevelopment. The focus of the identification of the factors of success in this paper is going to be included among their causal, planning and execution contexts through a direct analysis and territorial diagnosis, territorial planning and territorial management (Gómez Orea, 2007).

In this chapter, there is going to be explained first a conceptual framework for factors and indicators implied in the brownfields phenomenon, and the different existing approaches from relevant literature (sub-chapter 3.1.1); following with the statement of the analytical framework (sub-chapter 3.1.2) that embraces the previous notions, with its transposition, justification and description of the methodology used for it. All this information will set up the procedure of the identification of the factors of success for the following Case Studies comparison in section 4.

3.1.1 Conceptual Framework

The Oxford dictionary defines ‘factor’ as *“a circumstance, fact, or influence that contributes to a result”* (Oxford Dictionary). In the brownfield context, this term is understood as those different elements that characterize the site-level context of a specific scenario, shaping its possibilities of recovery and redevelopment across time. These **‘factors’** for the successful redevelopment of brownfields are needed to overcome the existing barriers in that specific case, and consequently tackle the degradation of the area under study. But it is important to remember that *“brownfields are placed and rooted in a certain geographical space and time, which is hierarchically and functionally structured”* (Frantál et al., 2015; pp.93), this means that brownfields should be analyzed not just according to site-specific attributes/factors, but also to other indirect and contextual elements that affected the

current causal phenomenon, in short, projects and initiatives for brownfields redevelopment should be integrative (PSMIII, 2016).

In the specialized literature, authors use the following notions for factors: drivers, determinants, criteria or site parameters (Frantál et al., 2015), and as it is mentioned in sub-chapter 1.2.4, they tend to distinct between a two folded categorization for brownfields redevelopment: **drivers** (Ramsden, 2010; NICOLE, 2011; CLARINET, 2002; CABERNET, 2006) and **barriers** (Oliver et al., 2005; Jackson & Garb, CLARINET, 2002; Hollander et al., 2010; CABERNET, 2006; McCarthy, 2002). Not just limited to the current phenomenon under concern, but also for many others, as a simple and polarized categorization.

For the conceptualization of barriers and drivers in brownfields redevelopment, it is important to understand that these factors may vary from one country to another, even if according to Frantál et al. the **ideas of complexity and multidimensionality on brownfields** are common in different geographic areas. Some of the main European agencies in charge of brownfields redevelopment declare in relation with drivers, barriers and success: *“(...) successful brownfield development requires the integration of the interests of a wide range of stakeholders and the inputs of many technical disciplines, and that this presents challenges for project management”* (NICOLE, 2011; pp. 10); or *“(...) success depends on a huge number of interconnected factors”* and *“(...) the ultimate success of the brownfield initiative is contingent upon a project’s ability to stimulate sustainable environmental restoration and economic development”* (CLARINET, 2002; pp. 7 & pp.15); in addition *“(...) the process of regeneration is affected by local, national and European drivers and barriers. Understanding these drivers in the context of land use relationships, with emphasis on understanding the dynamics of EC policy, local planning and economic drivers on the process, can only be achieved from a multi-stakeholder perspective”* (CABERNET, 2006; pp. 18).

In summary, this categorization and polarity is necessary, but it may dismiss the main objective when the existing frameworks (from sub-chapters 1.2.2 and 1.2.3 respectively) are complex, with gaps and depending the potential success in a vast range of interconnected elements, there are consequently provoked **action consequences**. That is why this paper embraces a more concrete and pragmatic approach, for local and site-level environments: the only focus on those factors, drivers, determinants or site parameters that are needed for a successful process of improvement and revitalization (partial or total). In summary, this identification of the main drivers and barriers is going to be achieved with the analogous one for the success factors afterwards.

The nature of these factors is causal, coming from the basic factors (those under concern), to other secondary ones, that can be understood as: conditions, circumstances, actors, agencies, etc. (Frantál et al., 2015). Consequently there is no theory relied on them directly, being the existence of these factors caused by multi-level and multi-disciplinary contextual and causal characteristics. In this way *“They are the causes of the fact that some brownfields have become objects of concern of investors, politicians, experts or other actors, they have been prioritized as the most critical, urgent or profitable to invest money, time and energy, they have been regenerated and newly used, while other sites are out of attention, they stay neglected and derelict, or the process of their regeneration has not been successfully completed”* (Frantál et al., 2015; pp. 93). So the identification of these factors set up the promotion of initiatives of implementation in affected areas, varying the interests on a specific derelict area if its characteristic factors are favorable or not for a successful redevelopment, for example: the existence of ecological burden, overall regeneration costs, return time on investment, clear ownership relations, etc. (Frantál et al., 2015).

Most of these factors can be expressed through a list of measurable **indicators** (quantitative and qualitative), giving in this way a specific weight or importance to the factor under concern. An indicator is defined in the Oxford Dictionary as *“thing that indicates the state or level of something”*. In the brownfields phenomenon, those indicators (size of the area, level of contamination, property value, land uses, etc.) are measurable characteristics in the affected area, originated by causal contexts, that describe qualitatively and quantitatively, the existing conditions and elements that characterize the brownfield under concern, establishing through the combination and categorization between them, a list of factors that are simply necessary to target, set up and propose remediation and revitalization strategies. Bacot & O’Dell insist in the importance of the standardization of indicators in the brownfields phenomenon, through a federal leadership (in the U.S. and national and supra-national leaderships in Europe) *“to ensure uniformity and comparability across levels of governments and programs”* (2006, pp. 142).

This is also the reason why the three Case Studies have been chosen in the same country, coming from a similar framework basis and being able to use common factors/attributes from possible similar indicators among the cases. But even with this common basis, the indicators that measure the initially detected factors, might need to be chosen before the development of the Case Studies (see **Chapter 4.1**).

In the specialized literature, different authors propose a list of factors and the subsequent indicators through different approaches, Bacot & O’Dell (2006), Wedding & Crawford-Brown (2007), Nijkamp et al. (2002), with a tendency to avoid site-scale perspectives or

focused on regulations and no into direct action perspectives. Obviously, the identification of these indicators may differ from one author to another, depending on its factor's emphasis in the analysis. The selection of factors in this paper (see next sub-section), as well as the subsequent one for the indicators (see chapter 4.1), is going to be in accordance with the selected OT methodology for the analysis (see the following sub-chapter).

3.1.2 Analytical Framework

Regarding the possible analytical framework through which those factors of success are going to be identified, there are going to be explained different methodological statements. First, is needed to state an initial list of the main factors "*a priori*" according to a specific methodology and then identify their possible effects through common indicators along the three Case Studies "*a posteriori*", stating a common basis for the comparison later on. Frantál et al. (2015; pp.93) state: "*It is not possible to say 'a priori' which of the general factors, location factors or site specific factors are the most important ones*". That is why this initial list is stated without their weighting on the different factors. For a complete and rigorous explanation about the weighting methods for factors, their indicators and related criteria, there would be needed a specific and comprehensive research, not included in this paper (being the main purpose of the project restricted to the determination of the main factors of success for their systematization in brownfield scenarios). Of course, the importance of some factors and its indicators can differ from one case to another, being in different geographical areas and contexts, but as soon as the selected "*a priori*" factors and indicators will be fixed and in accordance with a coherent analytical framework, the Case Studies comparison will be achieved effectively.

Probably, the weighting criteria for factors of success may need another research project by its own. In addition, for a correct weighting criteria and the sub-sequent work of assessment, evaluation and monitoring, it would be necessary the application of different multidisciplinary techniques such as: the use of GIS tools, mathematical algorithms, photogrammetric disciplines, Spatial Data Infrastructures, among others. Where through an exhaustive work of identification and characterization, the complete analysis and importance of those attributes transposed from the OT methodology would be achieved.

This selection of factors, their categorization and measurement through a range of indicators, plus the comparison of real world cases, is going to be embraced by three steps developed after the current paragraph: First, **the transposition of part of the OT methodology (1)** (Gómez Orea, 2007) as the main methodological criterion and protocol.

Second, in accordance to this analytical framework, the non-exhaustive “*a priori*” **selection of the main factors** that will be identified in the different Case Studies **(2)** and finally, through an “*a posteriori*” precept, **the identification of the effects (3)** or how those factors appeared in the different selected scenarios, through a non-exhaustive process of research and determination processes. After, it will be possible to state and develop the comparison between the three Spanish brownfields, with its subsequent analysis of the possible findings. The next figure displays the logical structure of this analytical framework within the flow of the project.

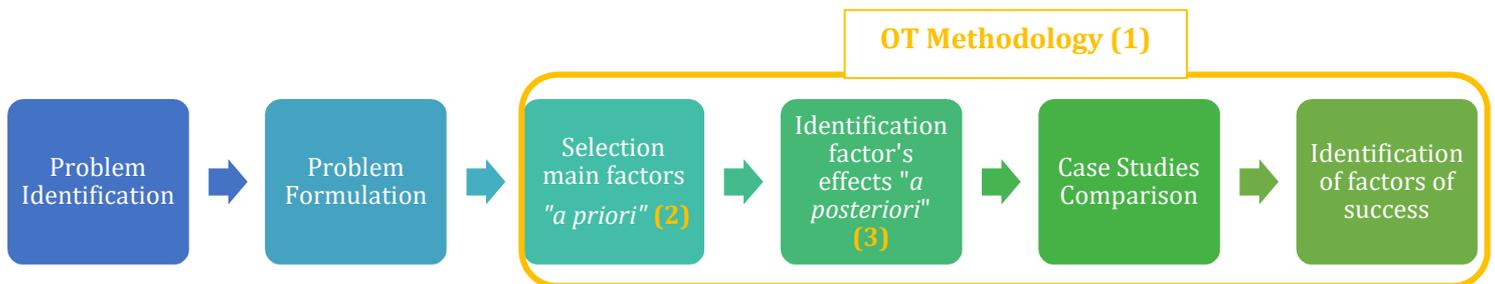


Figure 17. Logical Structure of the analytical framework (own source)

(1) This OT methodology of Gomez Orea (2007) is characterized by pursuing the development of **Spatial Planning Plans** and it contains different sequential phases from where it is possible to state direct territorial characterization and analysis that might be useful for the corresponding identification of the characteristic factors and indicators of a brownfield. In this sub-section is going to be explained the OT methodology, its main characteristics and approaches, its purpose and its transposition, interpretation and justification for the phenomenon under concern.

First of all, a methodology is defined as “*a logic sequence of concatenated tasks (...) a group of tasks well differentiated which are executed according to a specific order*” (Gomez Orea, 2007) and it is needed for an appropriate and coherent analytical framework where to refer in the development of the cases comparison, the identification of the drivers and barriers for redevelopment and in consequence de factors of success.

According to Gomez Orea (2007), Spatial Planning in general can be understood as well as a sequential and iterative process, oriented to long-term objectives, and no matter the content, extent or the orientation would be, by keeping the same schema, it is materialized through the development of four cyclical phases that allow

progresses and setbacks (Gomez Orea, 2007) also valid for the recovery of contaminated areas (Gomez Orea, 2004), (See Figure 18): **preparatory phase, territorial analysis, territorial planning and territorial management.**

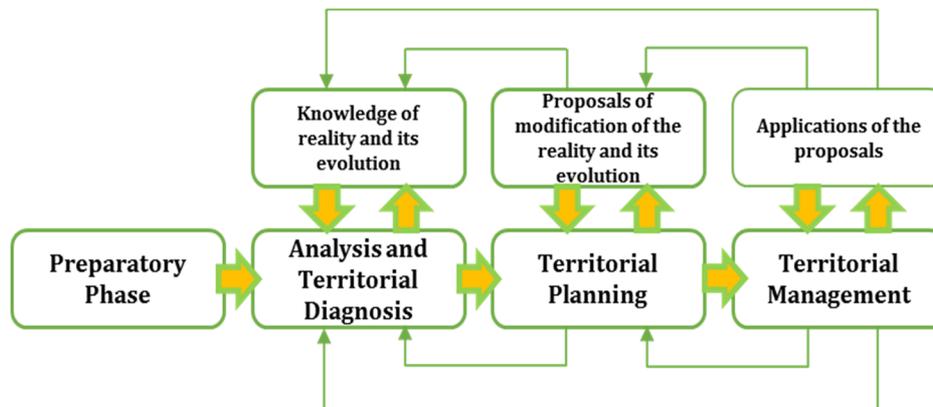


Figure 18. Based on the schema of Gómez Orea (2007; pp. 2)

The preparatory phase is necessary, due to the reasons that even if it is already a causal context existing, it is essential to describe the context through which the brownfield was created, later on it would be possible to state the current territorial diagnosis, based and taking into account all the previous information from this preliminary phase. In this way, the objective of this methodology would be elaboration and execution of a plan or group of plans, specific **for a concrete area or sector** (or brownfield) as well as instruments that can provide a regional (regulations for the CCAAs), national (urban legislation) or supra-national (development and regional cohesion) footprint.

Throughout this methodology, and before explaining the transposition itself, it is needed to clarify why its partial transposition of this methodology is appropriate for this paper. First of all, the importance of the **time-line** through the abovementioned sequence of phases: characterization of the existing situation, planning of amelioration according to this existing reality and finally the execution of these measures of amelioration; proposing an horizon of future possibilities, being a basic perspective for the recovery of brownfields. Thereupon, the consideration of **integrative and multidisciplinary procedures** that are necessary for initiatives of land revitalization. In addition, the following approaches and characteristics (among others commented by Gomez Orea) have to be highlighted for a correct understanding of this methodological statement and its possible application to the

brownfields phenomenon and consequently to our Cases Study Comparison: **the importance of the endogenous perspective (a), the interdependency between the economic and ecologic planes (b), the strategic character (c), the incremental character (d) and the finalist aim (e).**

(a) Gomez Orea (2007) emphasizes the importance of the local and site-perspective, in short, the endogenous character. This means the importance of the local resources (natural, artificial, human, spatial, etc.), and from there following a bottom-up process with a site-focus of the environmental integration and territorial balance of the different local communities that are part of the brownfields scenarios.

(b) The character of this methodology underlines a clear interdependency between economy and ecology (bilateral link dismissed sometimes in the brownfield context in favor of economic profitability) merging socioeconomic issues as important variables in junction with the put in value of the environment, pursuing this way an integrative aim that is crucial for projects of brownfields redevelopment.

(c) In relation with the content approach, it can be distinguished two points of view: comprehensive or strategic (Quote Gomez Orea, 2007). The aim of brownfield's remediation embraces both of them, looking to understand the problem and then to solve through a specific strategy. But regarding the current perspective of the identification of the main drivers and subsequently the factors of success, the emphasis is going to be in the strategic approach, focusing on those critical aspects that are restricting the recovery of the contaminated area.

(d) Regarding the approach in the method, the improvement of a brownfield case with the existing supra-national and national framework, allows to state two directions: First the so-called "Spiral of Improvement" (see the Figure below), operating through cycles, achievable targets in a short-term delay, using them as a platform for new and more progressive and ambitious objectives, with a spiral of continuous improvement (Gomez Orea, 2007). In this way, the identification of drivers in some Spanish cases of soil contamination may state the possibility of a more systematic characterization and identification, for a more efficient framework of action, for the effective resolution of more cases.

separated in four time-line categories corresponding with those three phases respectively (See Figure 21); it is going to be displayed using the visual variable color for the commodity of the reader and its correct understanding of the methodological approach. In this way, the Preparatory phase will contain the **Contextual Study** of the scenario (**Phase 0**), the Analysis and Territorial Diagnosis is going to be transposed as the **Initial Characterization** of the brownfield, (**Phase i**); the Territorial Planning will be commuted to the statement of the **Planning for New Uses** (**Phase ii**); and at last the Territorial Management will be applied through the **Execution** of those potential plans (**Phase iii**) containing the new uses and shifts from the previous phase. In conclusion, four categories have been created to distinct possible drivers and barriers for redevelopment, and consequently, the factors of success. The following figure (Figure 21) shows this transposition and categorization:

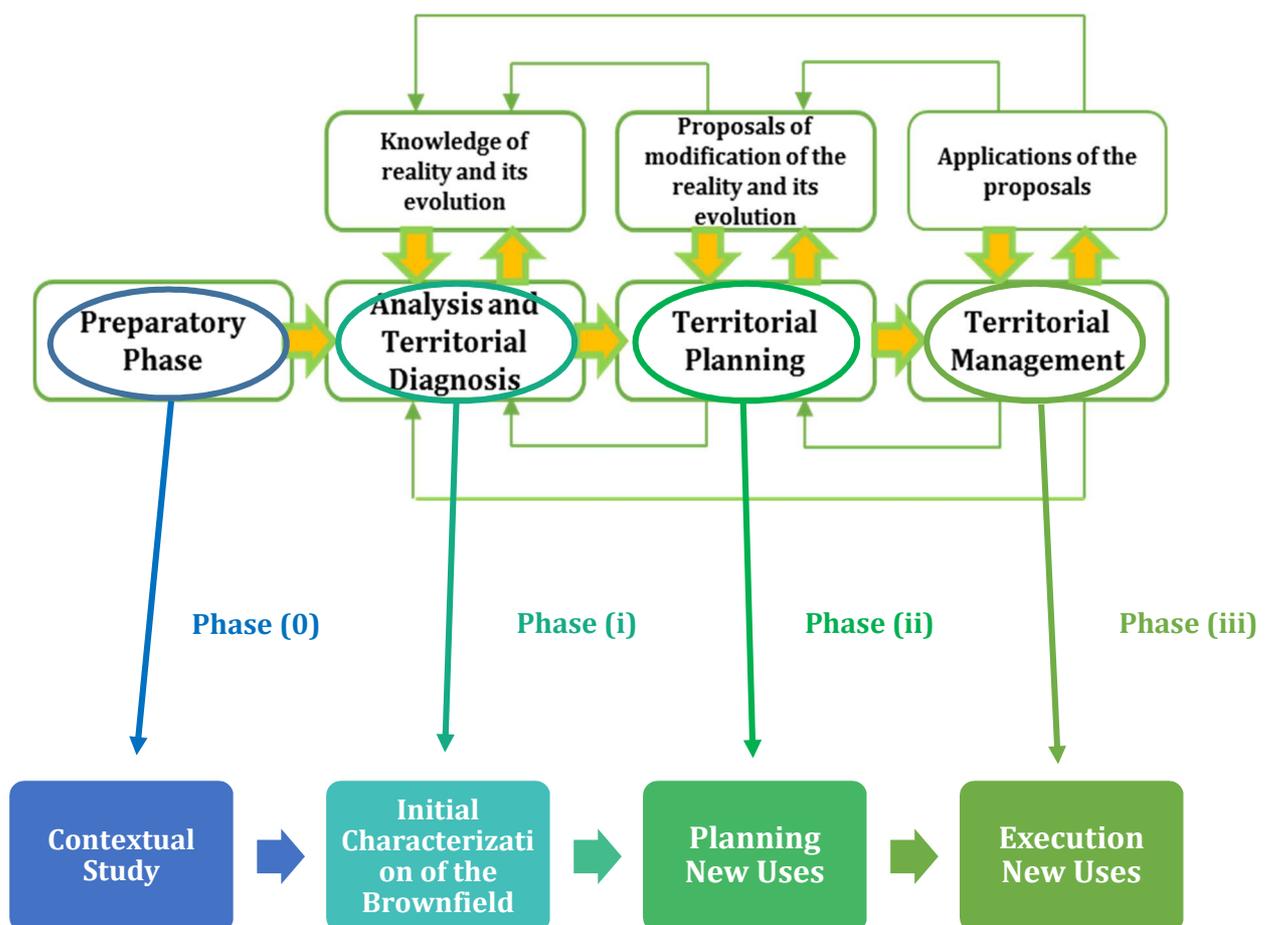


Figure 21: Transposition of the OT methodology to the brownfields phenomenon
(own source)

With this time-line categorization, the recovery-perspective for the brownfield is emphasized and stated as a sequential process where the objective image (Quote Gomez Orea, 2007) is the remediation of the contaminated/derelict land. As it is possible to see, the stress on the sequential phases, time-line character and the new categorizations, proposing a clear and simple transposition where it may be possible to reach the objectives pronounced previously in the problem formulation (chapter 2.2). With the methodological framework clear and affectively transposed to brownfields, it might be possible the identification of drivers and barriers, and subsequently the factors of success. The next sub-section describes how this initial list of the main factors is stated. At last, the following one explores the criterion through which those elements (drivers and barriers) that promote or reduce redevelopment all along the Case Studies, is explained and justified.

- (2) The “*a priori*” selection of factors is achieved through the transposition and adaptation of the categories from the OT methodology to the recovery of contaminated areas (Gomez Orea, 2004). It is crucial the “*a priori*” characteristic due to the reason that with this common outline of factors, the “*a posteriori*” identification and comparison of the subsequent effects can effectively be reached if it exists a common outline among the three cases. These “*a priori*” and non-exhaustive selected factors are understood as “*(...) intrinsic characteristics of the affected area that are considered relevant to define, plan and project its treatment*” (Gomez Orea, 2004; pp. 92). In other words, it is necessary to get ready an initial common list of factors to then analyze their effects through the comparison of some of their qualitative and quantitative indicators (stated at the beginning of Section 4) to identify which of them are acting as drivers or barriers for redevelopment and finally identify those factors of success. Without this initial list, it wouldn't be possible to establish any comparison if the selection of those main factors is achieved “*a posteriori*”.

This initial list of factors is categorized originally by Gomez Orea (2004) in four groups: the physical environment (land as a resource, the existing landscape, scientific-cultural resources, etc.), the existing infrastructures (including its limitations), opportunities of location (advantages due to spatial location) and the existing regulatory conditions (that may affect the area under study).

Then it might be relevant to emphasize what Oliver et al., state: “(...) *developing further classifications based on environmental, social or economic factors would be of great value for any authority in prioritizing its brownfield objectives*” (2005; pp. 7) as an appropriate, integrative and multidisciplinary grouping. Consequently this categorization proposed by Gómez Orea may dismiss some basic elements that condition brownfields and its general perspectives and opportunities. First, **the social perspective**, key in the process of redevelopment and then, **the purpose of recovery of the brownfield**, objective image of the methodology and emphasis in the process of revitalization through the sequential process across the time-line. As a result, two of those categories have been substituted by other two that might be more appropriate and necessary for the object area of analysis. “*The existing infrastructures*” may not be one of the “*front row*” categories (but in case there would have some relevance for the case they will be included in the OT category of the Contextual Study, Phase 0) and “*the opportunities of location*” group might not being relevant as a category, but some of the possible content can be included in the phase (0) as well (see previous and next sub-sections, **(1)** & **(3)**) throughout the transposition of the OT methodology with the brownfields phenomenon.

The current transposition and adaptation of the categories is displayed in the next figure, plus the list of the selected main factors that belong in each of these categories:

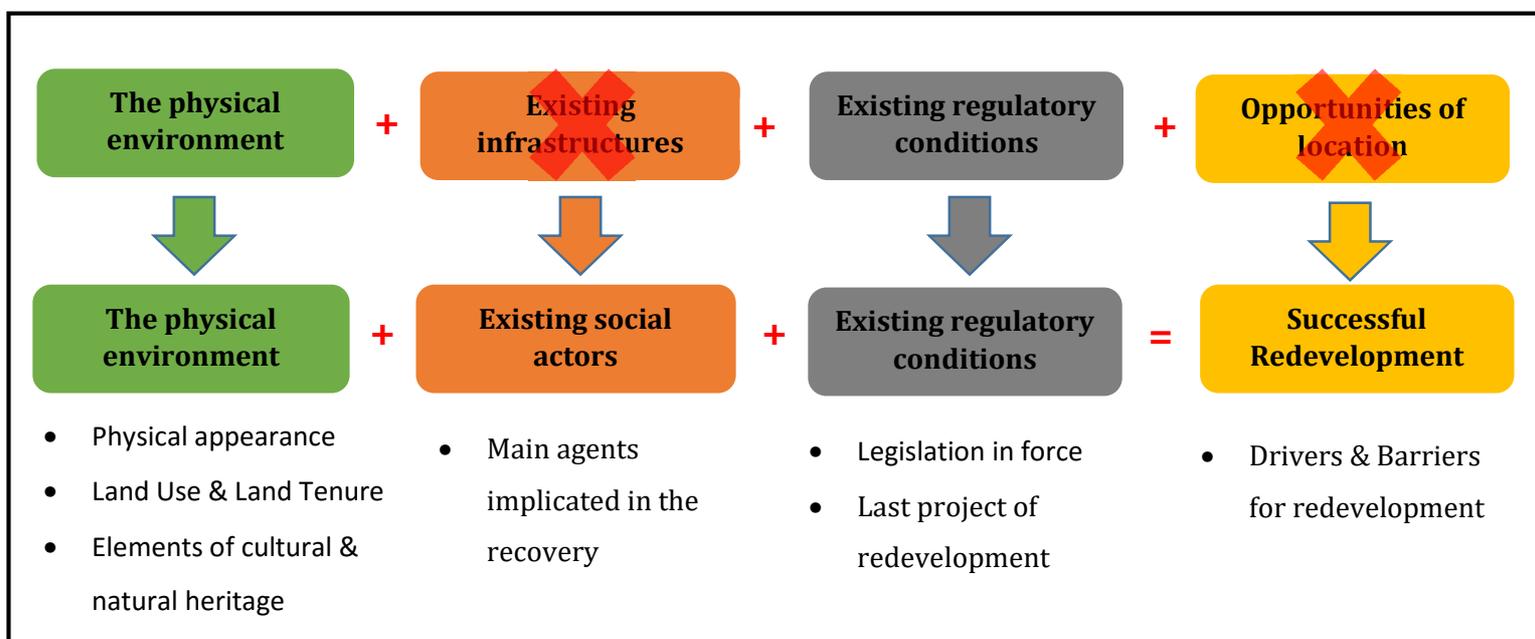
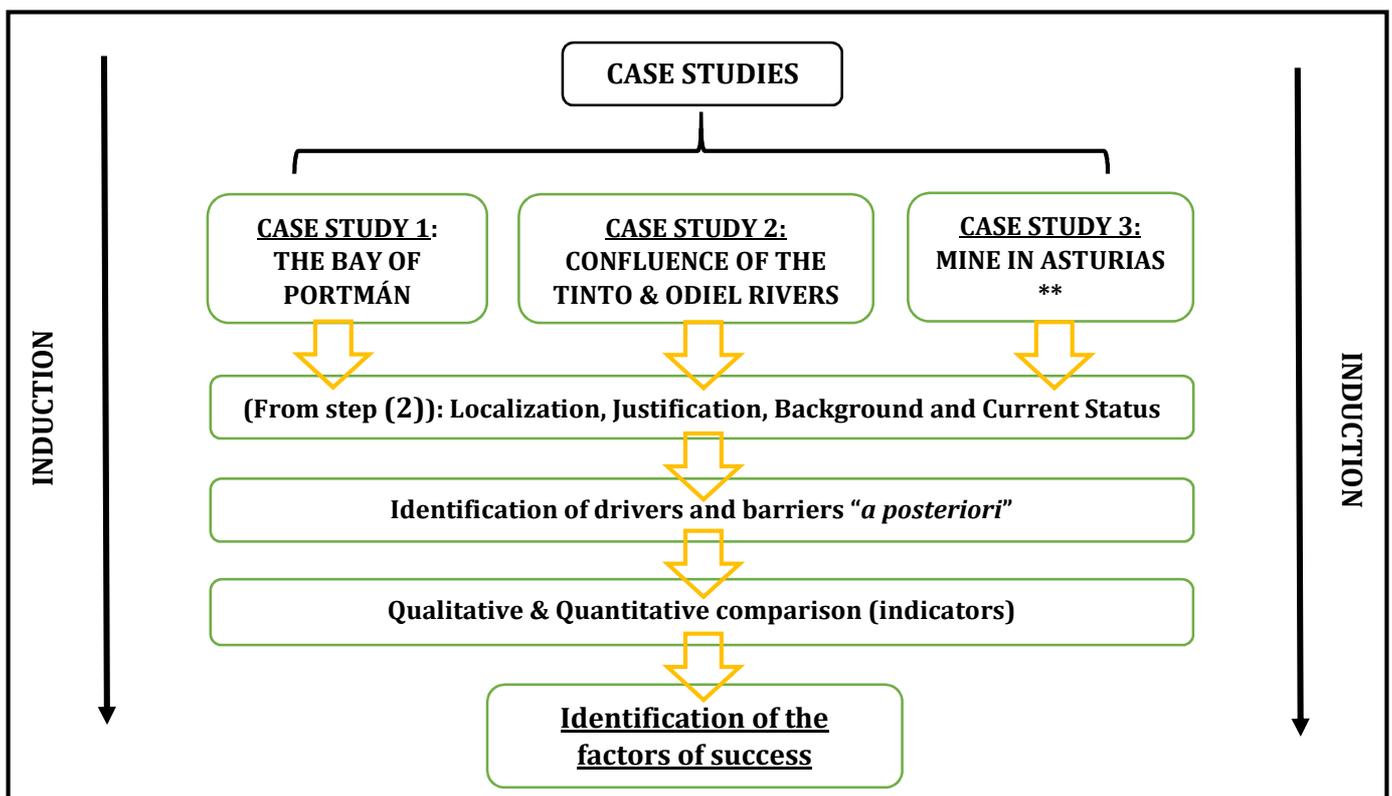


Figure 22. Transposition and adaptation of the OT methodology to the BF phenomenon

The character of this initial selection and list of the main factors is deductive from the abovementioned analytical framework, differing from the inductive identification of their effects and comparison of convergences and divergences (see next sub-section). The different main factors that will be used for, as a common outline for each of the three CSs, belong to different categories, transposed and adapted from OT to the targets of the current paper. Those categories are not going to be differentiated and respected as soon as the following merging in point **(3)** is going to be effective, being “a priori” categories which only purpose is to group the “a priori” factors, without any influence afterwards.

If we revise each of the bullet points, it is stated a non-exhaustive but integrating description of the different multidisciplinary actors, elements and conditions (of environmental, economic, social, physical, legal and political nature) that could influence the scenario under concern. In addition, this permanent emphasis on the time-line that the analytical framework permanently includes, is present as well in this selection. The following sub-section will close the explanation and justification of the analytical framework, by making effective the merging of these selected main factors with the stated analytical transposition described in sub-section (1).

- (3)** For the appropriate process of induction that is intended, the identification of the effects of those factors is going to be ‘a posteriori’ in all the Cases. The *Figure 23* below summarizes the logical flow of this ‘a posteriori’ identification (own source).



Furthermore, the induction for the three Case Studies has to merge the analytical framework: the OT methodology and its sequential phases previously reasoned and explained. This merging is feasible according to the different points that are going to be developed in each Case Study (CS). Thus it is necessary to reach three conditions: **the effective deduction of the “a priori” stated list of the main characteristic factors for brownfields** from the analytical framework (achieved it in the subsection above), **the effective induction for the identification of the effects of the factors of success “a posteriori”** (Figure 23 above) and **the effective merging with the analytical framework in this process of identification.**

Now if we try to find coincidences in this time-line variable among those points of the CSs (Figure 24 below) and the four phases of the OT methodology (Figure 24 below), that state three sequential phases through, it is possible to identify different convergences in terms of time-perspective (see Figure 24), belonging each one of the bullet points of the CSs to one of the sequential phases transposed above from the OT methodology.

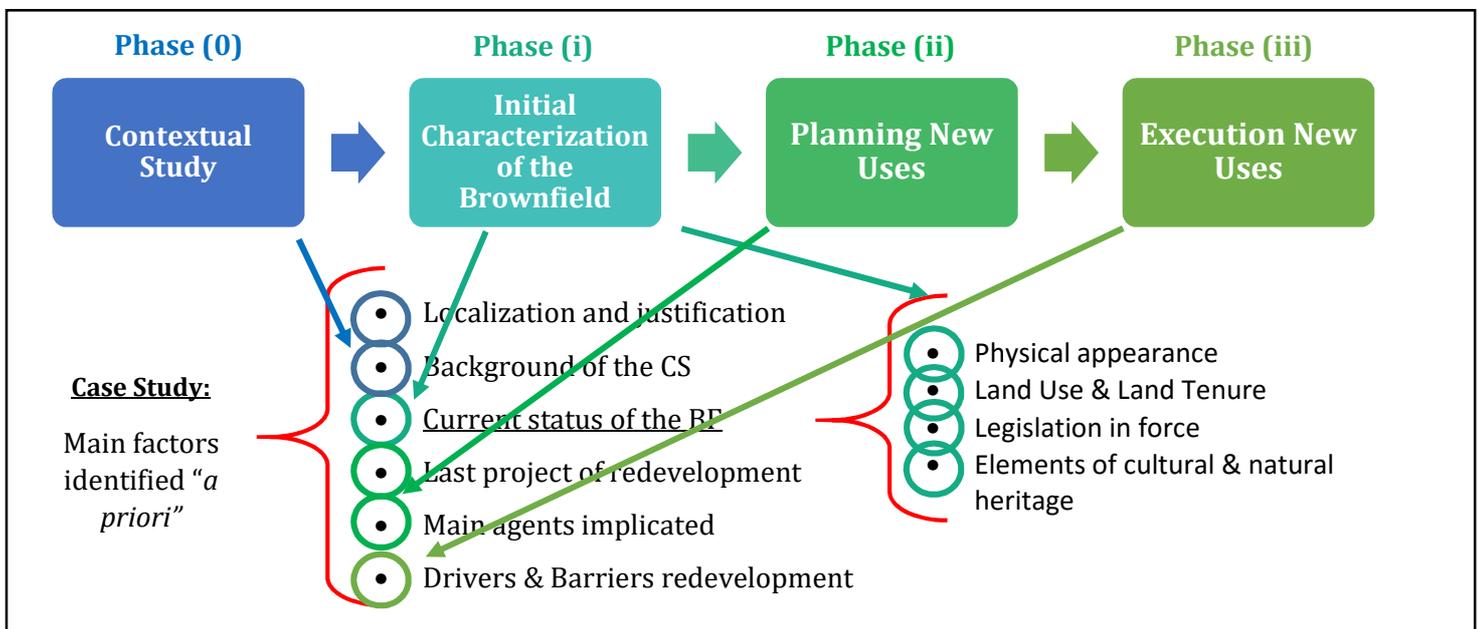


Figure 24. Link sequential phases – “a priori” factors (own source)

The **Phase (0)** would contain: *Localization and justification* and *Background of the Case Study*, needed for a previous contextual content where the different principal conditions that determined and shaped the causes of the current brownfield are

developed. Then, the initial characterization of the brownfield, **Phase (i)**, embraces all the points included in the *Current status of the BF*, related with its physical characteristics, land use and land tenure of the area, the regulations that exist and the existence or not of natural or cultural assets, keeping the integrative character of the analysis. **Phase (ii)**, through the explanation of the last project of redevelopment aims to highlight the perspectives and consequences of the intended perspectives for remediation and revitalization and the nature and role of the main stakeholders implicated in the process. At last, **Phase (iii)** emphasizes the successful application or not of that previously exposed project, identifying the drivers/factors and barriers/blockers for redevelopment.

The chart below shows the final distribution of the initial selected main factors merged among the four phases of the transposition of the OT methodology to the brownfields phenomenon:

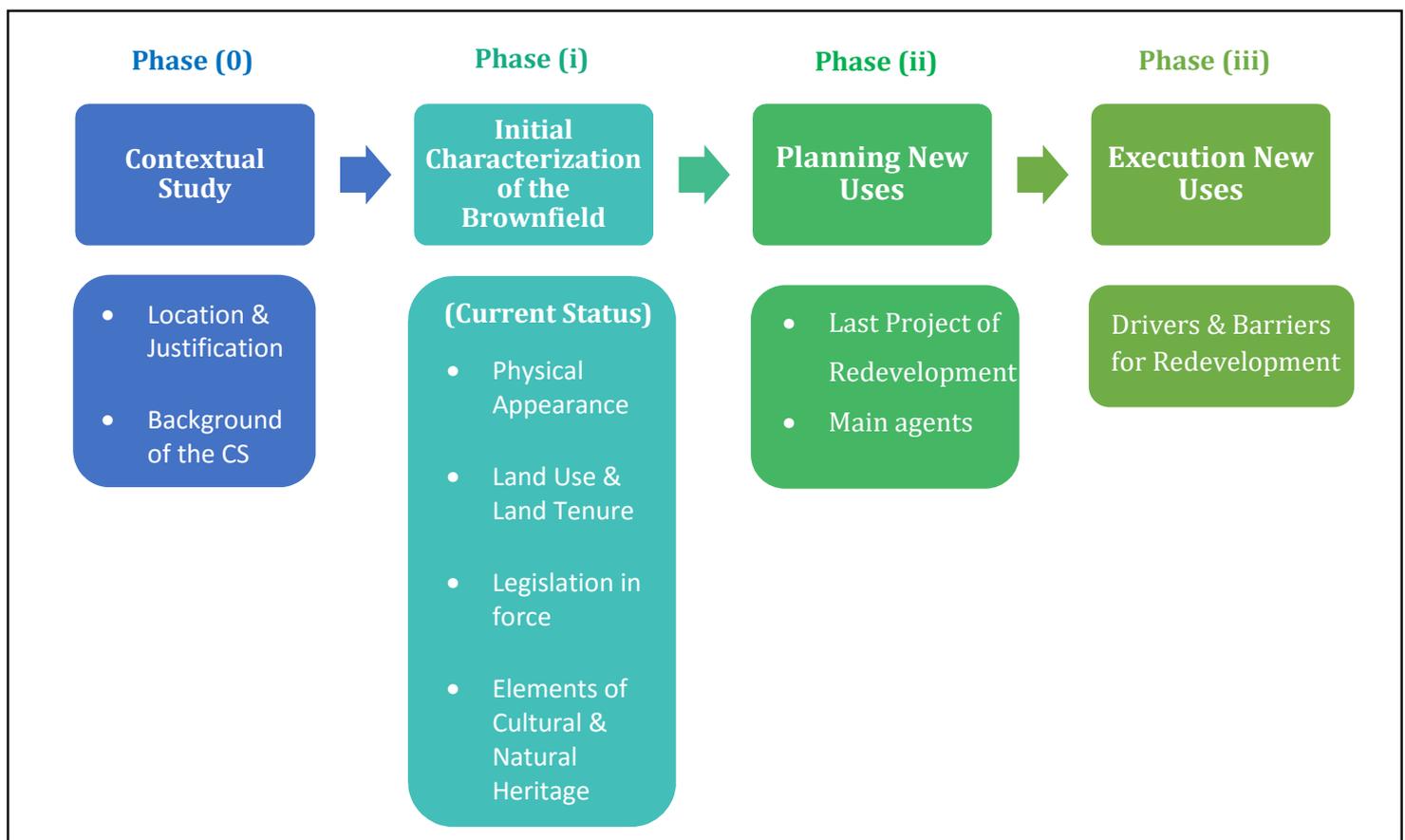


Figure 25. Distribution among the sequential phases of the main factors

In conclusion, the merging of the Case Studies with the transposition of the OT methodology for the brownfields phenomenon, can be assumed as appropriate and coherent with the purpose that pursues this paper.

4 Section 4

4.1 CASE STUDIES

The selection of the Case studies, with different level of success among them, show the opportunity to emphasize in the effect of those main factors previously identified that stress the horizons of recovery. Furthermore, one of the reasons why the three Case Studies have been chosen in the same country, answer the need to have a minimum of these factors in common, even if the site-contexts of those Case Studies can differ from one region to another and consequently their regulations and stakeholders. Moreover, all the three cases have been identified with a common spatial context and common origin: scenarios outside big urban agglomerations (except **CS2**, located really close from a head of the province), important presence of natural environment, originated from industrial activities (mining **CS1** & **CS3**, nowadays underused, and chemicals **CS2**), but with a strong influence in the local communities as part of their local identity.

After the whole explanation and justification of the conceptual-analytical framework from the previous section, the point of departure here is, the “*a priori*” selected factors and their association with each of the phases from the OT methodology adapted to the brownfields phenomenon. Those phases proposed in Section 3 are going to shape the structure of each of the selected Case Studies (**CS1**, **CS2** and **CS3**), displaying the following sequence:

Case Studies Structure. Phases and Factors.

- **Phase (0) Contextual Study:** Location and justification & Case Study background
- **Phase (i) Initial Characterization of the Brownfield (Current Status):** Physical appearance, Land Use & Land Tenure, Legislation in Force and Elements of Cultural and Natural Heritage
- **Phase (ii) Planning of New Uses:** Last Project of redevelopment & Main agents implicated
- **Phase (iii) Execution of New Uses:** Identification of Drivers and Barriers for redevelopment

As it is underlined in sub-section **3.1.1**, the majority of those main factors that appear in the

frame above, are measured through different multidisciplinary indicators with a qualitative or quantitative nature. Being this paper a non-exhaustive research and non-exhaustive analytical document, and taking into account the existing contextual framework of the phenomenon (sub-section 1.2.1), meaning lack of systematization in the recovery of brownfields in Spain, it is needed to state at this point which multidisciplinary indicators have been chosen to measure the effects of the selected factors all along the CSs.

Indicators have been defined and explained generally in sub-section 3.1.1, but there was no need to state at that point both the selected factors and the selected indicators. It is now, when the Case Studies are going to be exposed (and consequently the work of research achieved, understanding which relevant and indicative indicators should be chosen, being aware of the characteristics of each of the Case Studies) the appropriate moment to specify and agree on the indicative indicators that are going to be identified as qualitative or quantitative effects in the scenarios under concern. The chosen indicators will be common for the three Case Studies, stating then also a common basis necessary for the comparison later on (**Chapter 4.2**) added to the similarities among the three cases regarding origin, nature, “*a priori*” selected factors and now their characteristic indicators.

In this way, the criterion for the choice of a specific indicator is based on if this indicator keeps a strong link with the factor that this one illustrates or no. Many indicators can illustrate qualitatively or quantitatively the factor they measure, even more with this wide and multidisciplinary phenomenon where there are so many fields involved. Likewise each author may be able to develop a more or less exhaustive list of them, emphasizing specific aspects from specific fields. In this paper, the selected indicators will be an indicative and non-exhaustive list of qualitative and quantitative examples that displays sufficiently the measure of the selected factor that it is aimed to analyze.

It is necessary to clarify as well before continuing, that among the four sequential phases, **Phase (0)** and **Phase (iii)** don't have the need to select a/some specific indicator/s to measure their characteristic factors. This is due to the following reasons: First **Phase (0)** is a Preparatory or Contextual stage, where it is developed a descriptive explanation of the location, justification of the choice, origin, etc. with a purely introductory aim for a correct understanding of the case; then **Phase (iii)** identifies through the traditional two-folded distinction Drivers-Barriers (see sub-section 3.1.1), in other words, which of the factors from **Phase (i)** and **Phase (ii)** and their subsequent indicators, help or block somehow the process of redevelopment of the brownfield; so it is a consequential identification across

the different factors which effects have been determined through the observation of an indicative outcome of their characteristic indicators.

Then **Phase (i)** will contain the majority of factors and their indicators, being the characterization of the main representative features of the brownfield, its diagnosis based on the current evidences and consequently the description of the current physical, regulatory and natural factors. Finally **Phase (ii)** embraces the main difficulties of recovery arisen by the key issues of the last project of redevelopment presented, focusing on the economic approach (key for the revitalization) and the political and the social one (public or private agents implicated) that may help or block the process of recovery.

The following two figures will show visually and respectively: the connection between each of the four phases, their "*a priori*" selected factors, and their subsequent chosen indicators, stating a common schema of identification for the three Case Studies (Figure 26); then the list of indicators from the two sequential phases that include any indicator, with their nature, (Figure 27).

The identification of the effects of those main factors (previously selected and belonging to each of the four phases presented and justified beforehand) will be achieved in the sub-chapters **4.1.1**, **4.1.2** and **4.1.3** respectively, with a short description of each Case Study background, the current status of the brownfield, last project of redevelopment and the **identification of the traditional categories of drivers and barriers for the process of recovery**. Each phase from each CS is going to end up with an indicator's table, to highlight the findings that are going to be compared afterwards in the **Chapter 4.3**.

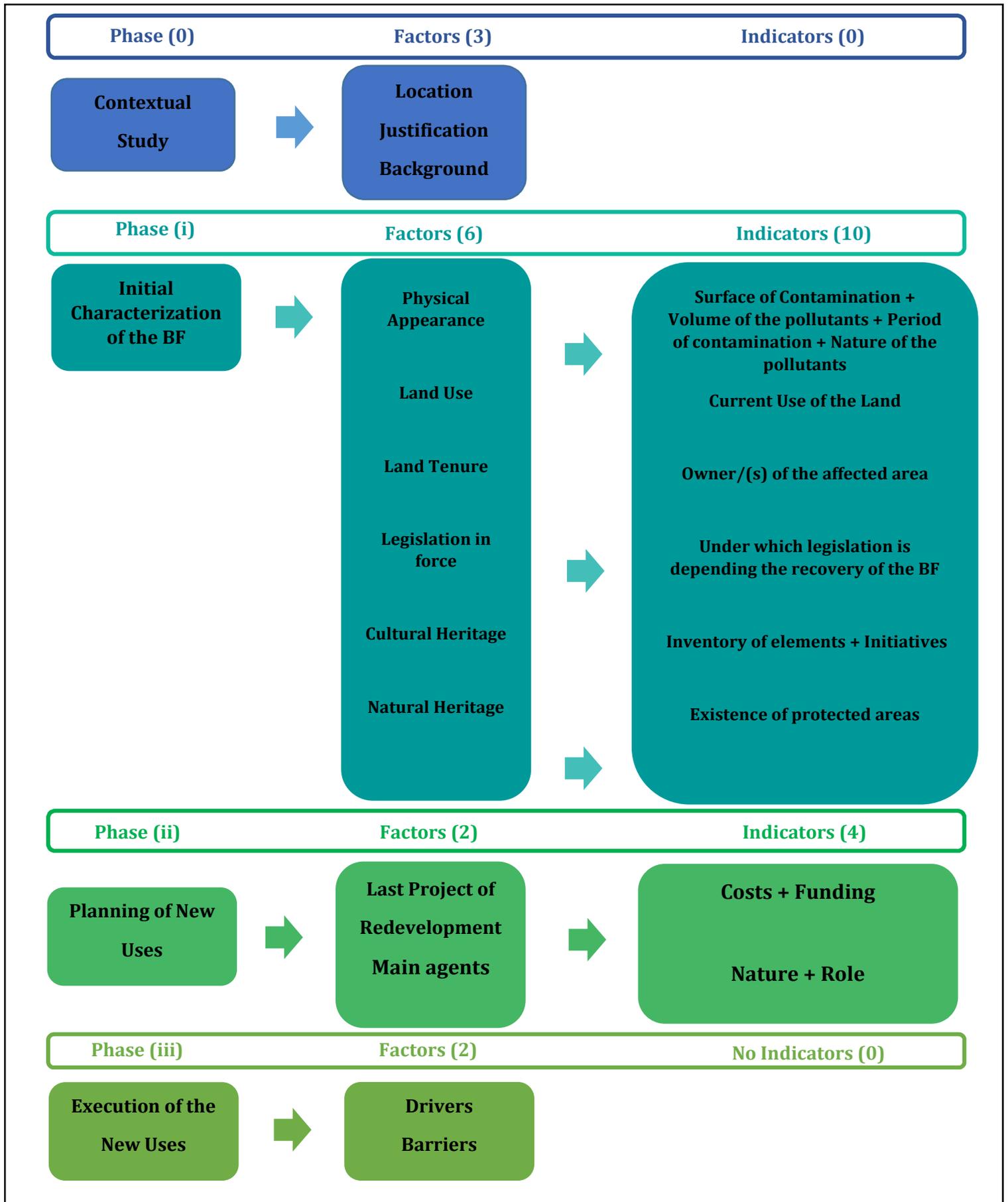


Figure 26. Phases, Selected factors and chosen indicators (own source)

Phase (i): Initial Characterization of the Brownfield

SELECTED FACTOR	CHOSEN INDICATORS	NATURE
<ul style="list-style-type: none"> Physical Appearance 	<ul style="list-style-type: none"> ✓ Surface of Contamination ✓ Volume of the pollutants ✓ Period of Contamination ✓ Nature of the pollutants 	<ul style="list-style-type: none"> Quantitative Quantitative Quantitative Qualitative
<ul style="list-style-type: none"> Land Use 	<ul style="list-style-type: none"> ✓ Current Use of the land 	<ul style="list-style-type: none"> Qualitative
<ul style="list-style-type: none"> Land Tenure 	<ul style="list-style-type: none"> ✓ Owner of the affected area 	<ul style="list-style-type: none"> Qualitative
<ul style="list-style-type: none"> Legislation in force 	<ul style="list-style-type: none"> ✓ Legal link with the process of recovery 	<ul style="list-style-type: none"> Qualitative
<ul style="list-style-type: none"> Cultural Heritage 	<ul style="list-style-type: none"> ✓ Inventory of elements ✓ Initiatives 	<ul style="list-style-type: none"> Qualitative Qualitative
<ul style="list-style-type: none"> Natural Heritage 	<ul style="list-style-type: none"> ✓ Existence & Nature of protected areas 	<ul style="list-style-type: none"> Qualitative

Phase (ii): Planning of the New Uses

SELECTED FACTOR	CHOSEN INDICATORS	NATURE
<ul style="list-style-type: none"> Last Project of Redevelopment 	<ul style="list-style-type: none"> ✓ Costs ✓ Funding 	<ul style="list-style-type: none"> Quantitative Quantitative
<ul style="list-style-type: none"> Main Agents 	<ul style="list-style-type: none"> ✓ Nature ✓ Role 	<ul style="list-style-type: none"> Qualitative Qualitative

Figure 27. Chosen indicators and their qualitative/quantitative nature

In addition, throughout the explanation of each of the phases in the different cases, some of the platforms or techniques that were necessary to register or monitoring those chosen indicators, or at least helped in their identification, are going to be highlighted as a breve mention (application of photogrammetry, or GIS and the use of geographical and technical information).

Each of the CSs is going to follow the same order and structure from the analytical framework, with the intermediate aim to identify the effects among the different scenarios of the selected brownfield factors. These Cases Study are the following:

- ✓ **CS1: The Bay of Portmán, region of Murcia, Spain.** Example of an unresolved case of brownfields. This case has been already treated by the author, consequently some of the information included come from the subsequent project (PSMIII). Also, being the first of the Case Studies to which the OT methodology is applied, through its content is going to be explained generally the more or less importance of each indicator in accordance with the conceptual- analytical framework clarified in the previous section. Consequently the length of the first CS is going to be bigger that the other two CSs.

- ✓ **CS2: Confluence of the Tinto and Odiel rivers, province of Huelva, region of Andalucía, Spain.** Example of a partially successful case of brownfields, where with the pressure of local groups and ecologists, an enterprise that was discharging pollutants in a huge dump site, few hundred meters from households, has stopped partially its activities and has proposed recently a project of redevelopment in junction with the regional government and the Ministry of Environment.

- ✓ **CS3: Nalón Valley, region of Asturias, Spain.** Example of a successful case of brownfield, where in an area deeply influenced by the mining activity (developed during more than one century), having polluted as a result the whole aquifer of the Nalón River in at least one third of the total length of the stream. The town-hall of the most important municipality in the area stated an integrating plan of redevelopment based on industrial transition and expansion, urbanism and environmental restoration, obtaining funding and collaboration from regional to supra-national one.

4.1.1 The Bay of Portmán (CS1)

The first Case Study of this paper is an example of an unresolved brownfield scenario with a specific context that has dismissed the options of recovery for more than 20 years after the end of the contaminating activities in the Mediterranean Sea.

Phase (0): Contextual Study

A. Location and Justification

This contaminated Bay is located in the Spanish southern region of Murcia and it is considered as the worst case of heavy steel pollution of the whole Mediterranean Sea, after 30 years of discharges of pollutants. In addition, the Bay of Portmán is an example of an unresolved Case, with still no approval of a project of redevelopment, since the stop of the mining activities in the early 90's, due to different barriers that are constantly blocking and delaying any remediation initiative. Moreover, this case is located in one of the identified brownfield hotspots in Spain (CABERNET, 2003) named in the sub-chapter 1.2.3: the area of Cartagena (Murcia), where there has been an intense and traditional mining and commercial contexts even before the Roman civilization (Baños Páez, 2011 & García García, 2004). Portmán belongs to the municipality of La Unión, located in the surroundings of Cartagena and in the middle of the so-called Mining Mountains ("*Sierra Minera*"). These mountains, with a surface of 100 square kilometers approximately, are considered one of the biggest and oldest mining districts in Europe (García García, 2004).

Nevertheless this tradition in the mining industry, the area under concern has great environmental assets, such as the Mountains of Cartagena, the regional Park of Calblanque, The Ash Mountain and the Eagle Crag. Therefore, this area provides locations under the SCIs (Sites of Community Importance), SPAMIs (Specially Protected Areas of Mediterranean Importance) and SPAs (Special Protection Areas for Birds) programs as well as relevant elements belonging to the Geologic, Mining and Archaeological Heritage (García García, 2004), originary from the mining activity and establishing an environment with plenty of elements of cultural heritage coming from the mining infrastructures, buildings and facilities (PSMIII). The figures below show the location of CS1 in Spain through the use of a national geographic viewer SIGPAC (MAGRAMA).

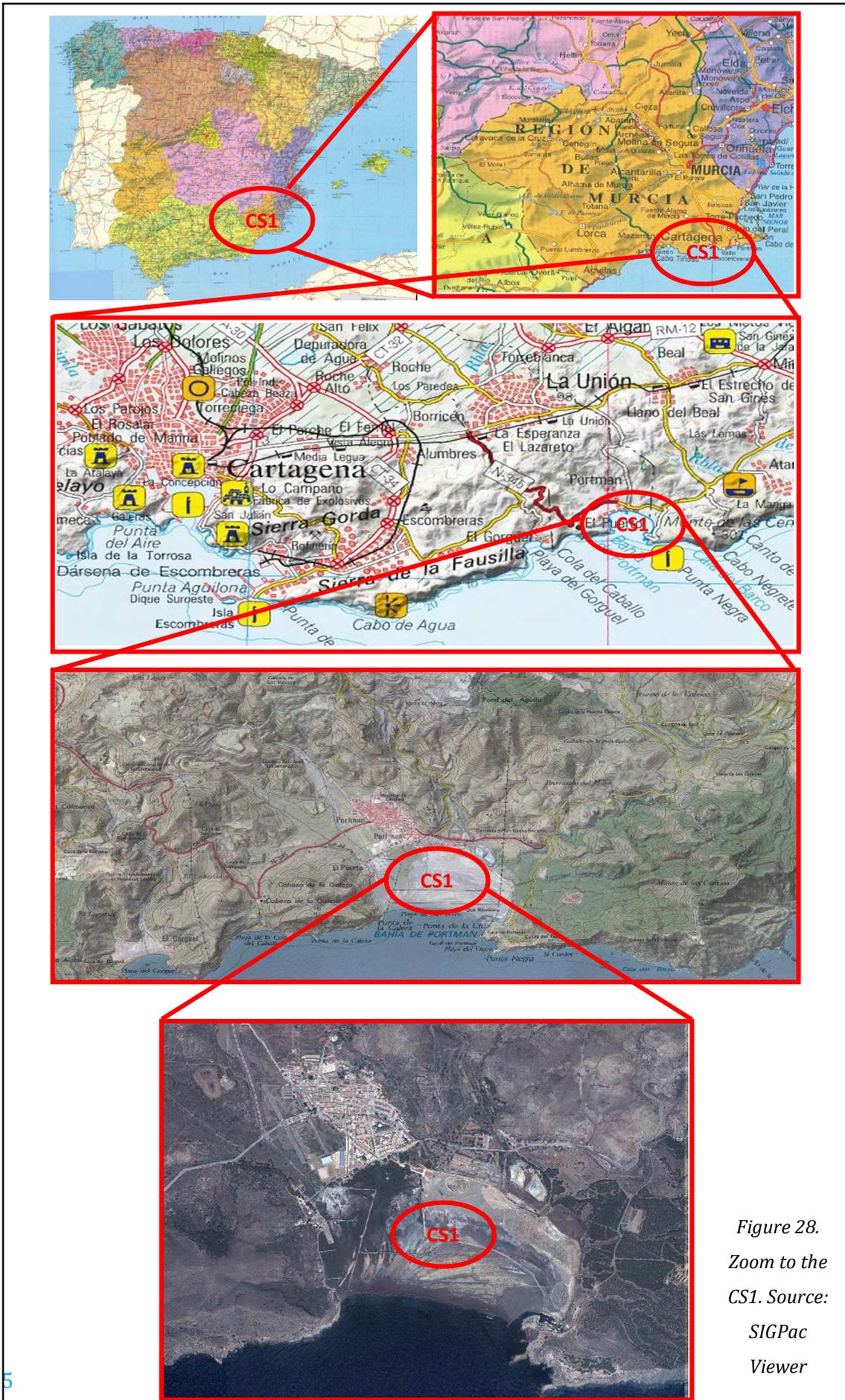


Figure 28.
Zoom to the
CS1. Source:
SIGPac
Viewer

B. Case Study background

The background of the CSs, phase (0), is a very important source of information for a correct understanding and interpretation of the different elements and conditions that shaped the current brownfield. As it is repeated previously, brownfields are causal scenarios, coming from a range of actions and decisions. Consequently there is again this emphasis in the timeline, also highlighted in the Analytical Framework (sub-chapter **3.1.2**).

- The mining activities in a large scale began in Portmán in the middle of the 20th century, using new techniques and technologies based on mining exploitation outdoors, from the traditional underground prospectings (Baños Páez, 2011), and setting up one of the biggest flotations sulfides treating sites by this period.
- With a permission from the Ministry of Public Works in 1959, it was approved the concession of the discharge of leftovers coming from the treating site into the sea (Baños Páez, 2011) through some pipelines, that were discharging 3.000 tons of leftovers per day directly to the Mediterranean Sea. Conflict with the local communities starts.
- After the death of Franco in 1975 and the end of his dictatorship, local communities increased the protests, involving the media. Different initiatives began to be stated but the current government at that moment denied the possibility of cleaning the whole bay, even assuming the existence of pollutants, but keeping them as soon as there wouldn't be any danger for human health (Baños Páez, 2011).
- In 1986 the NGO Greenpeace-Spain, through a symbolic act, closed the pipelines that were discharging the pollutants, giving to the Bay of Portmán a crucial relevance in the national media after three decades of contamination. After that in 1990, the discharges stopped (Baños-González & Paños Báez, 2013).
- The responsible enterprise, Peñarroya-España S.A. transferred in 1988 all the properties, facilities and responsibility to the trade company Portmán-Golf S.A., being the end of the mining activities in 1990 and the closure of the facilities in 1991 (Baños-González & Paños Báez, 2013), with the result of 60 millions

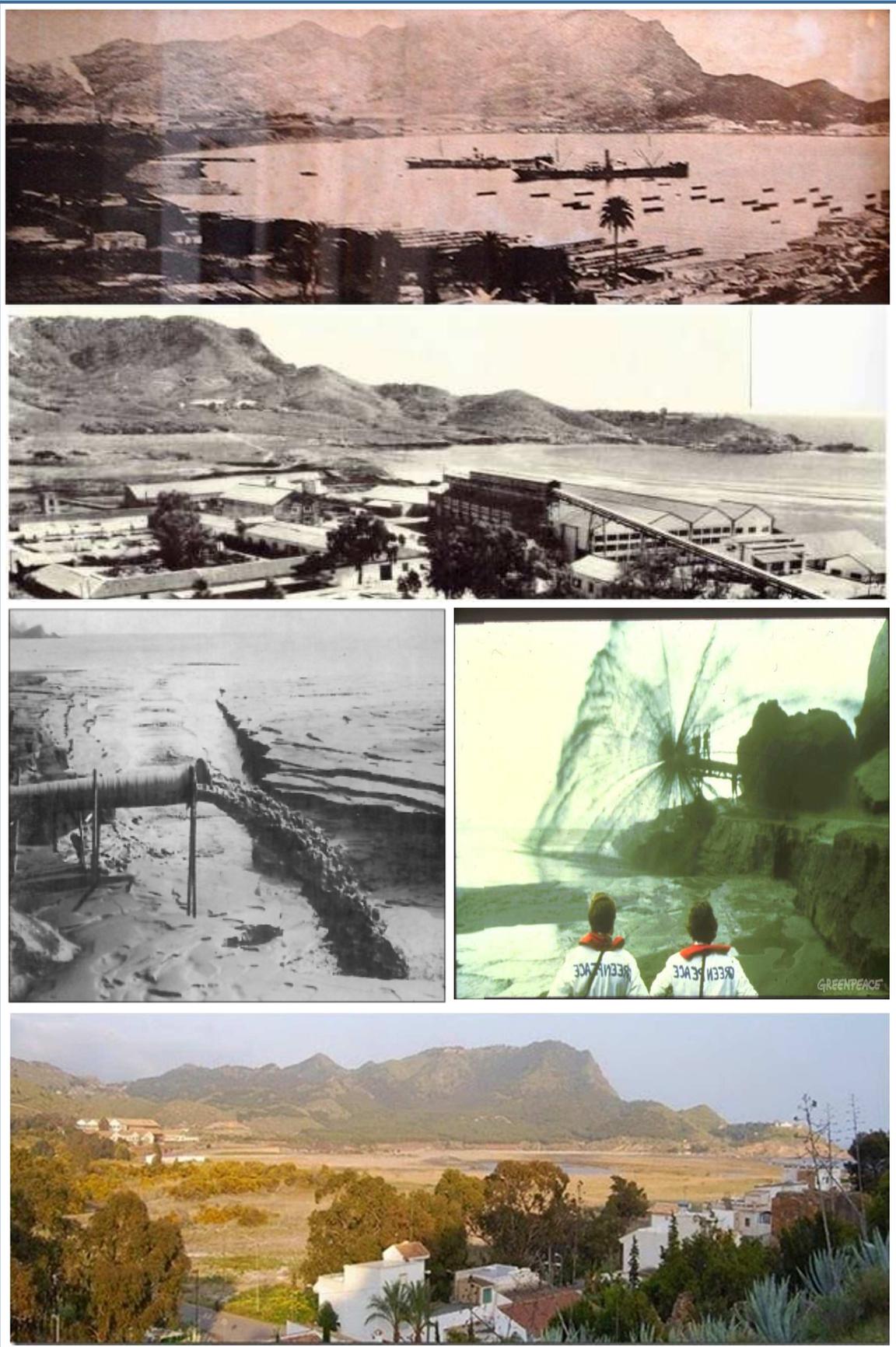


Figure 29. Images of the Bay of Portmán. Sources: PSMIII

of tons of sterile materials discharged into the sea, silting and filling with earth 75 hectares of the bay (Paños Báez, 2011). According to Baños Páez (2011), if we compare the quantity of solid metals and solid waste from the discharges of the Bay of Portmán with the whole quantity spilled all along history in the Iberian frame of the Mediterranean Sea, the Portman pollutants would be 50% and 90%, respectively. Consequently, the toxicity of those heavy metals plus the coverage of the sea bottom with infertile materials, caused the extinction of most of the wildlife species in the coastline as well as a huge extension of the sea bottom (PSMIII, 2016).

Phase (i): Initial characterization of the brownfield (Current Status)

A. Physical appearance

The current physical appearance has been documented with images and pictures from geographic viewers and databases belonging to the national or regional administrations (lacking this paper a fieldtrip to each of the three scenarios). The case of Portmán has huge visual evidences, consequently to understand the extent and effects, is going to be displayed the visual evolution of the affected area since the first existing aerial photo until nowadays. Through the visualization of aerial photos (See Figures below) from the regional Geographic viewer or Murcia, it is possible to see the evolution of the affected area from 1928 to the most recent one in 2013 (PNOA program). Moreover, there exists a detail “(...) *the frame of time between 1956 and the end of the discharges in 1990, has not, at least officially available, from the list of historical images from the Ministry of Environment (being the highest public entity in these issues), any aerial image during the period of maximum mining activity in the bay (...)*” (PSMIII, 2016; pp. 24). Is there any coincidence? Is it normal that the cartography from the Ministry may omit information from Portmán during the period of discharges?

Then, focusing on the most recent of the available aerial images of the bay (2013) and another picture donated by the Regional Environmental Agency of Murcia taken in 2012 (see Figures 31 & 32 below the aerial ones), it is possible to see and detect, the different elements that shape the existing physical appearance of the brownfield and its surroundings.

Figure 30. Aerial images 1928 – 1981. Source: SitMurcia Viewer + SIGPac Viewer

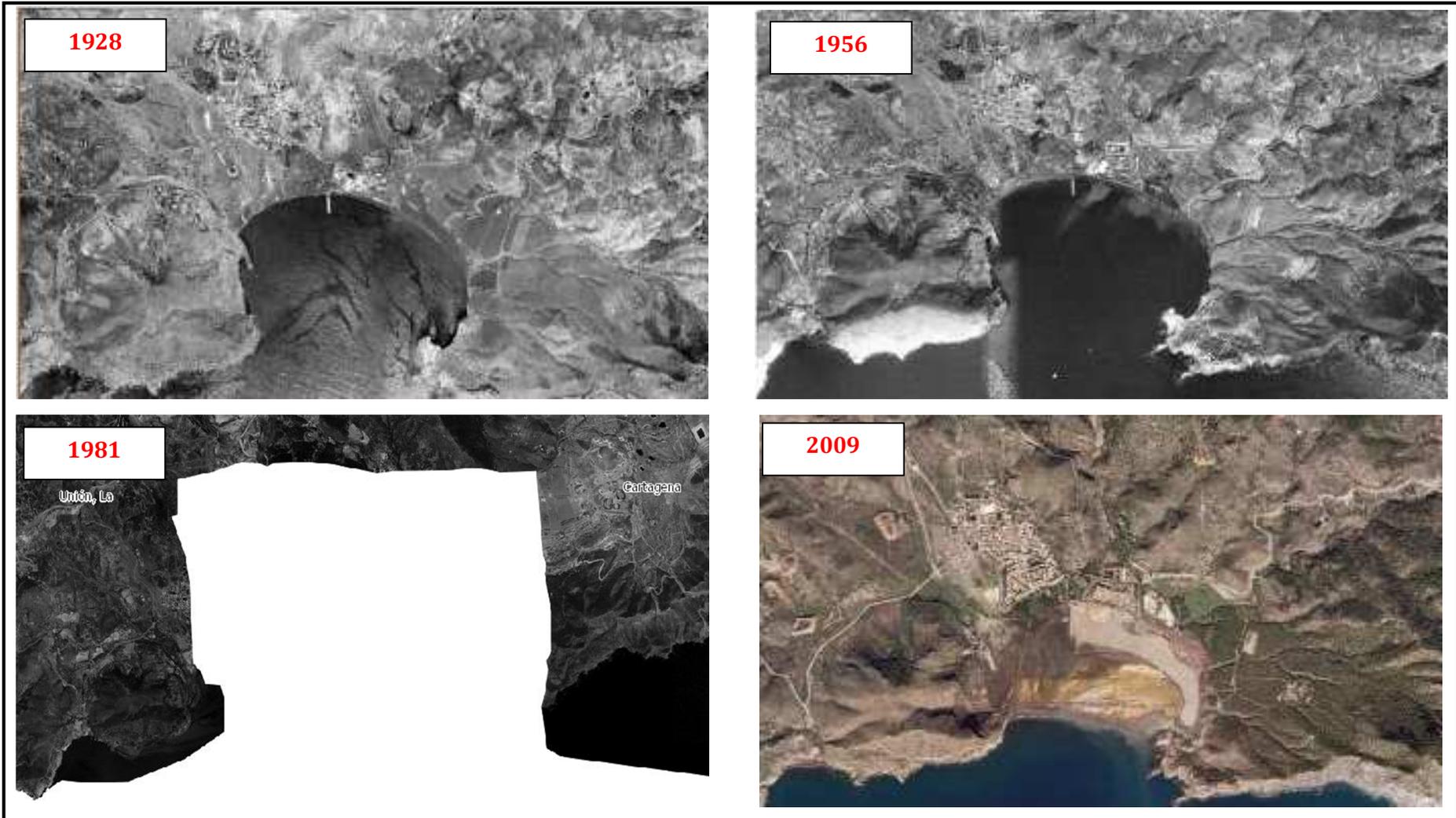




Figure 31. Image of the Mining Mountains (source: Baños Páez, 2012; pp. 23)



Figure 32. Detail of Portmán and its surroundings, PNOA picture (elaboration: PSMIII source: IGN, National Geographic Institute)

The first of the two images above shows the environment of the brownfield scenario, where it is possible to see the Mining Mountains, with an evident '*mining orography*', all around the district of Portmán and the municipality of La Unión, with its characteristic orography originated from years of mining activity in the area.

The second picture displays the brownfield scenario itself, from the most recent and official aerial picture that exists (2013) from the PNOA program (IGN). The different areas highlighted belong to (PSMIII, 2016): district of Portmán **(1)**; the supposed location of the old harbor of Portmán before the start of the contamination contexts **(2)**; the treating site so-called "*Lavadero Roberto*", infrastructure completely abandoned **(3)**; the whole bay of the district, covered by the pollutants from the discharges **(4)**; and the new harbor, having to move the infrastructure and facilities several hundred meters ahead due to the coverage of the bay by the pollutants **(5)**.

Regarding the chosen indicators associated with the physical appearance of the brownfield, few of them have been mentioned in the background of the Case Study: the **total surface of contamination** were **75 hectares** of the Bay of Portmán, with a total **volume of 60 million of tons of sterile materials** discharged into the Mediterranean Sea. The **nature of those sterile materials**, with very toxic components and a **high concentration on heavy metals**, were originated mainly from the discharges of the treating site "*Lavadero Roberto*" (primary contamination), but also as a consequence of secondary contamination, as a result of the coast dynamics, bringing mining sediments to the bay and finally the tertiary contamination, that arises from surface run-offs that located their material into the bay (Martínez-Sánchez et al. 2015). According to Martínez-Sánchez et al. (2015), the materials that shaped the soils of the bay of Portmán brought a very high level of toxicity with first, high concentration of heavy metals in the sterile materials directly discharged to the sea, such as **Cadmium, Zinc and Lead** (García García, 2004) and then the existence of toxic products from the cleaning of the mineral, for example: sodium cyanide, sulfuric acid, copper sulfate (Martínez-Sánchez et al. 2015), among others.

In relation with the period of contamination, it is true that the mining activity in the region was really extended across history. But the focus might be in the moment when the discharges from the treating site of Portmán began to be effective, in 1959, and the end of the discharges in 1990, meaning **31 years of discharges** conceded officially by the central Administration through the Ministry of Public Works. Consequently, this activity was announced as something legal, but morally inadequate, being the results present nowadays,

as a natural disaster. In summary, the following table displays the indicators abovementioned:

SELECTED FACTOR	CHOSEN INDICATORS	NATURE	CONTENT
<ul style="list-style-type: none"> Physical Appearance 	✓ Surface of Contamination	Quantitative	✓ 75 hectares
	✓ Volume of the pollutants	Quantitative	✓ 60 million tons
	✓ Period of Contamination	Quantitative	✓ 31 years
	✓ Nature of the pollutants	Qualitative	✓ Sterile materials with high concentration of heavy metals (Cd, Zn, Pb)

Table 10. Chosen Indicators for the Physical Appearance

B. Land Use & Land Tenure

Referred to the use of the land in the current Case Study, is going to be divided in two parts: on one hand the use of the land and on the other hand the land tenure and land transaction, “Being the brownfield a phenomenon that affects directly the possibilities of a territory and its potential uses” (Gonzalez Carmena PSMIII, 2016; pp. 63).

❖ Land Use

Here again, it is going to include a short approach of the traditional use of the land (apart of the current one), that has been going on in this area, as a signal of a massive and uncontrolled demarcation of the land that conditioned the possibilities of the local inhabitants all along the 20th century. This homogenous (in terms of productive activity) use of the land has shifted until the current uses nowadays where, based on the evidences from the geographic portals, it seems that there is a ‘static’ or ‘stuck’ context, with the new uses just adapted to the inherited conditions and consequences transferred during the last century.

Portmán has been never been defined as independent entity, always as a dependent district from the municipality of La Unión (Pérez de Perceval, 2015). Conditioned by the physical characteristics of the soil, mining outshined the rest of possible productive activities, and consequently the use of the land.

According to Pérez de Perceval (2015), the mining enterprise in charge of the majority of the local mining, Peñarroya S.A, didn’t modify the use of the land in Portmán, moreover it is directly responsible of the shift of the shape in the bay, having absorbed the already existing mining concessions instead of creating new ones. As a result at the end of the 19th century

all the municipality of La Unión (even the urban soil) was divided in mining concessions (Pérez de Perceval, 2015) See Figures 33 and 34,

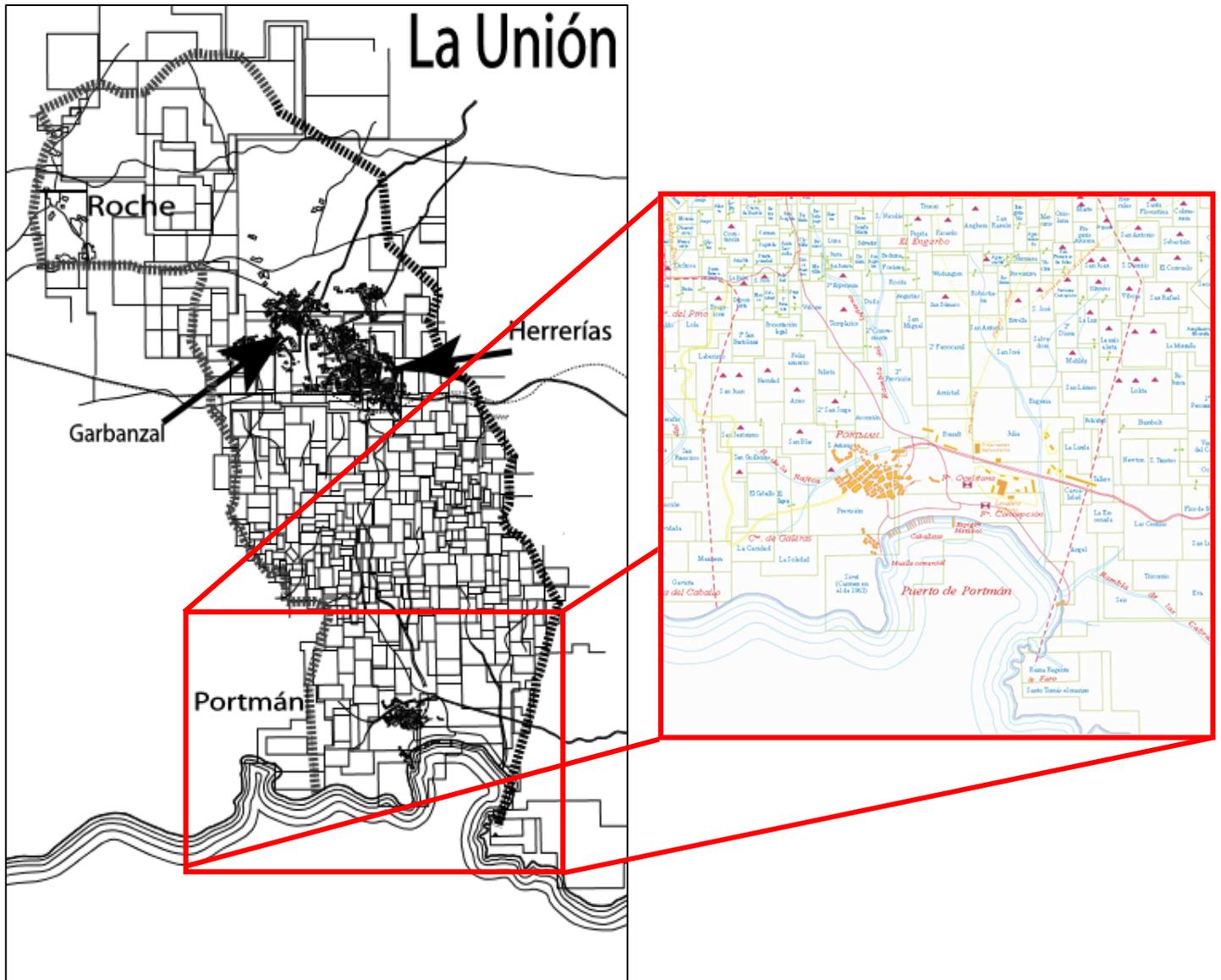


Figure 33. Digitalized map of the municipality of La Unión and its mining concessions based on the map designed by Carlos Lanzarote in 1907 (source: PSMIII)

Figure 34 Digitalization done by Pérez de Perceval et al. from the Mining Map of “Sierra de Cartagena y La Unión” by Carlos Lanzarote in 1907 (source: Pérez de Perceval et al., 2013)

Figure 33 shows all the existing mining concessions at the beginning of the 20th century, represented through squares all along the municipality of La Unión. The variable size of those squares represents the time since each of them was active (older – smaller ones and more recent – bigger ones). Pérez de Perceval underlines (2015) that the total surface given

to the concessions was bigger than the municipality of La Unión, exceeding some of them the boundaries of the municipality as well as the waterfront.

Now Figure 34 displays this massive sub-division of the mining properties in the surroundings of Portmán through the digitalization of an old Map from Carlos Lanzarote. At this point Pérez de Perceval et al. (2013) admit that the reduced area where each of the mining concessions were located was limiting the organization of work process, creating a chaotic distribution of mining concessions and demarcations contexts where the legislation at that moment was directly responsible (see C. Legislation in force).

In relation with the current uses of the land in Portmán, present nowadays, they might be **limited and conditioned by the intensity and footprint of the mining practices developed not that far away in the past.**

In this direction, the next page is composed by three Figures of Portmán and its bay: Figure 36 belongs to the official GIS Viewer of the Autonomous Community of Murcia and the SIOSE program (the Spanish Soil Occupation System), depending on the National Geographic Institute and the Ministry of Public Works. It shows the different current existing uses of the in Portmán and its surroundings; Figure 37 corresponds to the Planned Land Use (also available from the same geographic viewer of the region of Murcia), in accordance with the existing regional and local regulations, in terms of Soil Classification, SC (building land, protected land, etc.) as well as Land Zoning, LZ (Residential, Services, Industrial, etc.); at last, the author has included on top the original aerial image (Figure 35) of the area under interest to help to identify better the different areas and uses.

Those occupations of the land that appear in Figure 36 (next page), show the **lack of variety and diversity** for an area very damaged not just in terms of contamination of discharges and its consequences, but also due to the fast growth of the mining industry and its evident consequences in the soil, landscape, environment and orography. The same conclusions can be obtained from the Soil classification and Land Zoning from Figure 37; **being the majority of the land that surrounds Portmán, or protected due to the old mining areas or protected due to environmental and landscape assets.**

The picture previously showed of the Mining Mountains (Fig.31) illustrated perfectly this context. None of the existing uses or zoning seem to arise new horizons with attempts to emphasize any new comprehensive activity, stating a difficult scenario for a proper revitalization.

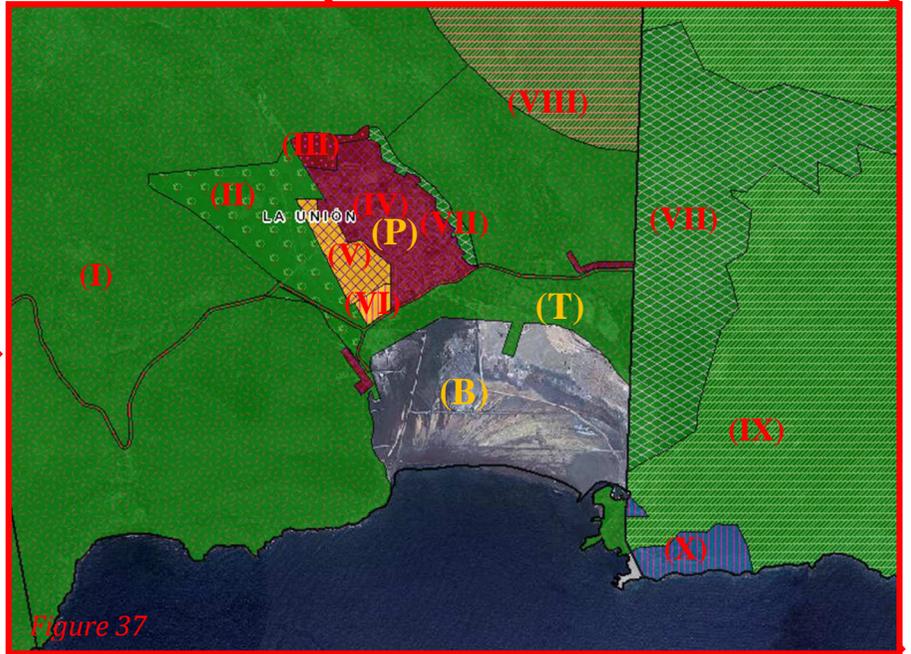
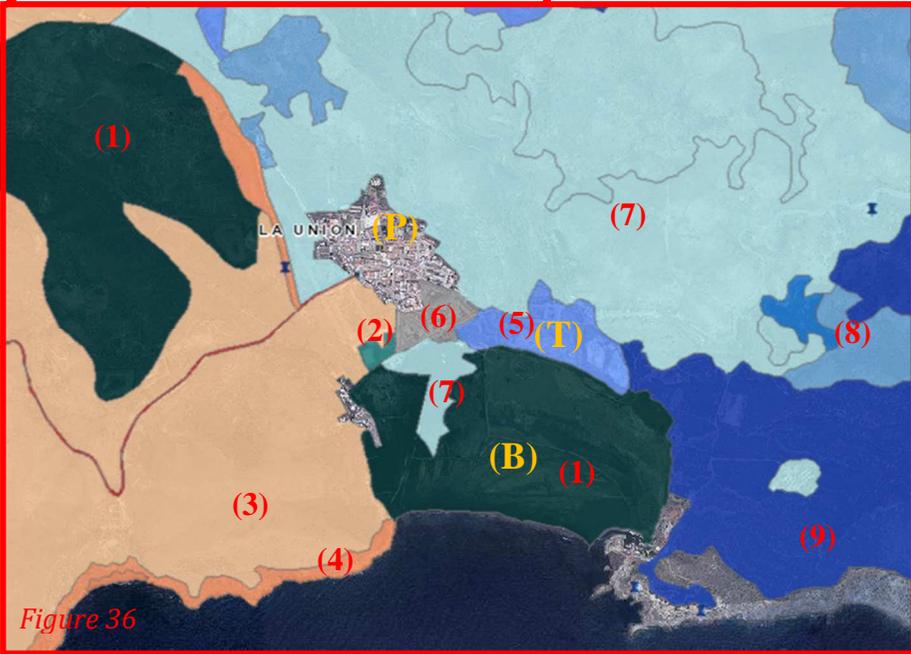


Figure 36

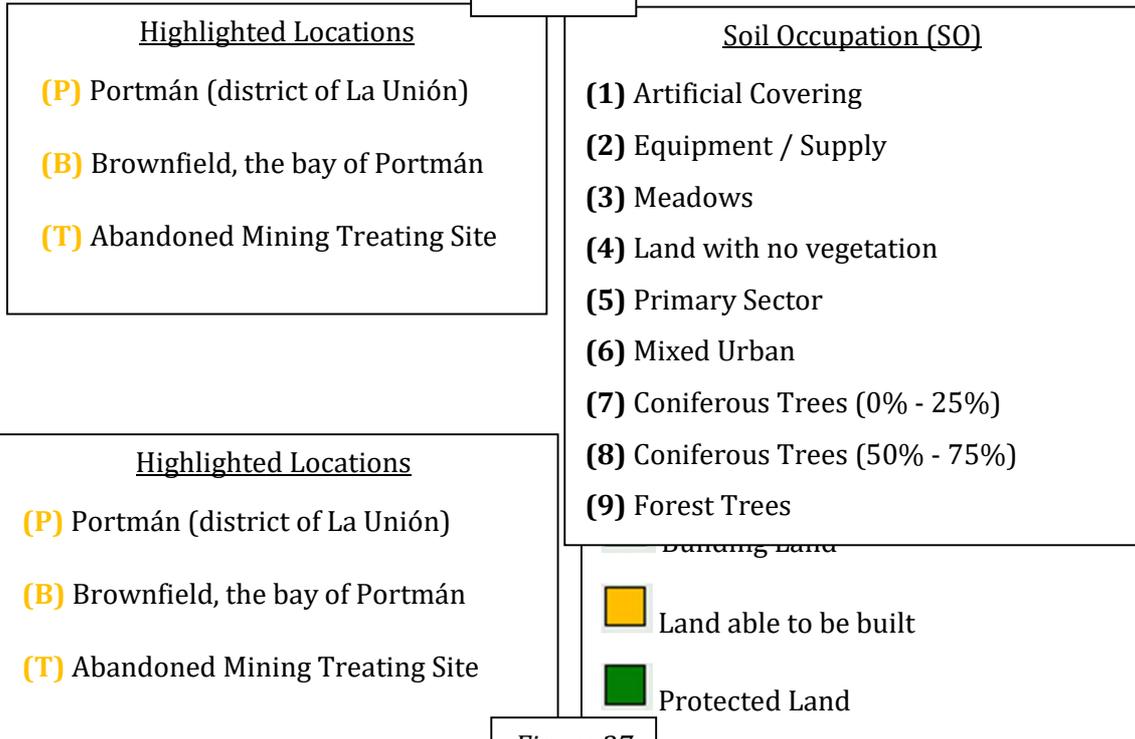
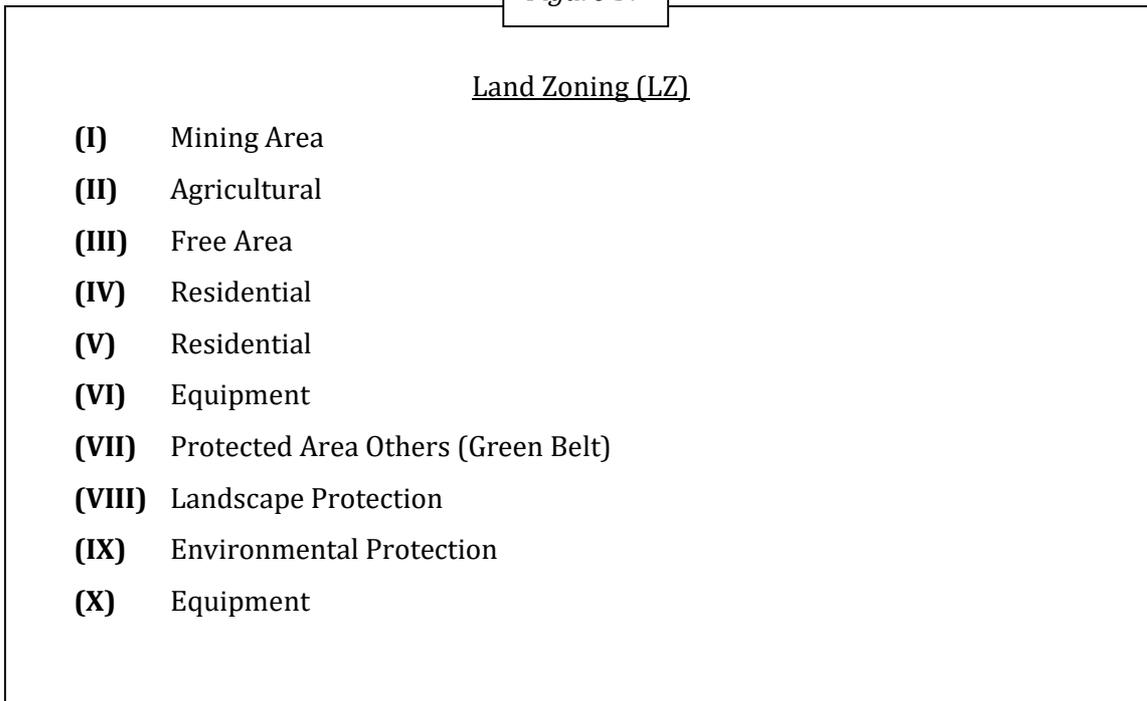


Figure 37



❖ *Land Tenure and Land Transaction*

During the first half of the 20th century, the majority of the mining demarcations affecting the area under interest, had as land owners, small owners ruling small mining concessions. Then from the 50's until 1988, the multinational Peñarroya – España absorbed the majority of those concessions. Finally in 1988 until now, the enterprise Portmán Golf S.A, received all

the properties, facilities and liabilities of the environmental disaster (Baños Gonzalez & Baños Páez, 2013). Through this transaction, Peñarroya transferred all its mining rights and properties to the new enterprise, **Portmán Golf S.A.**, created by two local business men (Baños Páez, 2011), obtaining as a result the majority of the properties of the Mining Mountains and **more than 90% of the properties of the urban area of the district of Portmán** (Baños Gonzalez & Baños Páez, 2013). The new Enterprise tried different lines of action: First, evicting the mining workers that were renting their apartments to the old enterprises; second, to sign with the local communities and agreement (using the mayor of La Unión as guarantor in case of conflict) for the sale of the apartments where the mining workers had rented to live in; third it pressured the Administration to recover the contaminated bay with public funding (understanding that the Administration was responsible in the past “*legalizing*” the discharges into the sea. Finally, their last aim was to reassess as building land, all the surrounding properties from the Bay, being the majority of them under their control after the transfer with Peñarroya (Baños Páez, 2011).

So it is evident to guess what where the purposes of Portmán Golf S.A., the author underlines in the PSMIII: “*So basically, the new enterprise was looking for its own benefit through the land transaction and land tenure of the majority of properties of the area, erasing first any issue related with the previous activity and aiming to set up a huge urban-touristic development (...) following the huge increase in Spain of buildings construction and tourist services in the majority of the coast areas of the Mediterranean Sea*” (Gonzalez Carmena, 2016; pp. 69). Having under their control 90% of the properties of Portmán it gives a context of redevelopment **based on restrictions and limitations imposed by the enterprise and debatable in terms of the common benefits of the local population.**

Through the geographic viewer of Murcia, it is possible to see the different existing properties but not their owners, registration etc. For that it would be necessary to ask an official permission for the access in the digital database of the Cadaster, depending on the Ministry of Taxation and Public Bodies. With this permission every citizen has access to the Cadaster (current and historical), but it would be necessary to ask this permission physically in Spain.

The following table will summarize the selected factors for the Land Use and Land Tenure and their chosen indicators:

SELECTED FACTOR	CHOSEN INDICATORS	NATURE	CONTENT
• Land Use	✓ Current Use of the land	Qualitative	✓ Conditioned by the previous activities, most of the land is protected due to old mining areas, environmental assets or landscape assets.
• Land Tenure	✓ Owner of the affected area	Qualitative	✓ The same private enterprise (Portmán S.A.) owns more than 90% of the urban areas of Portmán: limitations and restrictions pending on the enterprise's aim.

Table 11. Chosen Indicators for the Land Use & Land Tenure

C. Current legislation in force

First and insisting in this retrospective approach, necessary to understand better the current conditions, Pérez de Perceval et al. insist (2013) that the existing legislation during the 20th century was limiting and creating difficulties for the appropriate control and development of the mining activities, getting very popular in the area of Portmán and Cartagena as well as other parts of Spain (see sub-chapter 1.2.3). The following four past facts state:

- The legislation was giving permission to demarcate the territory in small portions of soil. When its abolition was effective, the majority of the Mining Mountains were completely covered already in an uncountable number of demarcations, causing land scarcity in terms of availability of land for the nature or for agricultural purposes (Pérez de Perceval et al. 2013).
- Spain has an important detail, it provides a different legislation for the ground than for the underground. The underground belongs to the State, giving concessions to those enterprises that wanted to exploit (Pérez de Perceval 2015).

- Pérez de Perceval (2015) admits that the legislation in the 1st half of the 19th century established a maximum area for any mining concession and that this limit has been expanded progressively.
- This expansion of the mining concessions has been achieved through: First the Law of 1825; then some Royal Decrees extended more the minimum of surface permitted; after, the law of 1849 enlarged this surface even more; following this tendency, the Mining Law of 1859 let the creation of mining properties with no limits regarding their extension; at last, the two following laws regarding the mining activity, both set up in 1868, completed the total liberalization of the mining demarcations (Pérez de Perceval 2015 & Pérez de Perceval et al. 2013).

In summary, the legislative context previous to the height of the mining activity in Spain provoked a chaotic distribution of mining demarcations and concessions, creating a context with an **uncontrolled management of the natural resources and their exploitation**, and possibly setting up one of the many negative precedents that may provoked the contamination of the bay and its subsequent blockage in its process of recovery.

The aim of this sub-section is to identify those legislative instruments or the qualitative content from them that would be linked with the process of recovery (or process of blockage) of the brownfield of Portmán. Being Portmán an unresolved case, consequently there is no element or elements from the regulations that applied to the case of Portmán, have to be emphasized as indicators for recovery, based on evidences. In this direction what is going to be proposed some of the different precepts stated in each of the different levels of the existing regulations that could be the key in case a positive horizon of recovery would be stated for Portmán. From each of the main regulatory forms at each level in the hierarchy, is going to be underlined one or two key issues or statements that would suppose an advantage in case they would have been respected.

In Section 1 (sub-chapter 1.2.2) it has been included a table (Table X) with the existing and updated main legislative tools for the brownfields phenomenon in Spain in a supra-national and national levels (phenomenon understood from the national perspective as soil contamination). Merging this information with the possible existing regulations in the

regional and local level, and their main precepts and characteristics, it is going to be possible to identify the indicators that could be assumed as links to the process of recovery for the brownfield.

Following a top-down order (so starting from the supra-national level and ending with the local one, likewise the order of the Table X) it is possible to state the following issues:

- The **'polluter pays' principle (a)**, probably one of the most standardized issue in the brownfields and waste management fields, **is completely dismissed in this Case Study**; this is due to the fact that the responsible enterprise for the discharges, Peñarroya-España S.A., transferred all the stock, facilities, infrastructures, contamination and liabilities to the local enterprise Portmán S.A. in 1988. To dismiss this principle opens more challenges than it seems: remembering some of the most basic elements to start proposing initiatives of revitalization (**sub-section 1.2.3**) for brownfields, one of the keys for redevelopment is the availability of funding, but with the responsible stakeholders omitting pollution's liability and consequently potential sources of funding, it states a context of blockage and vagueness, having some other entities to assume then the costs provoked by others.
- It is also right to insist in the fact that it was the Spanish Administration the entity that approved to start the discharges into the sea (**Prevention principle dismissed (b)** as well), so there are also partly liable for this environmental disaster. This principle is also getting important recently with emphasis in the national legislation about prevention. But what about those many scenarios that have been already contaminated and where this principle is definitely useless?
- Then, those conflicts arisen in the legislation in a national level have been already highlighted slightly in **sub-section 1.2.3**, and they will coincide in the different CSs, being the three of them under the same legislative framework nation-wide (**c, d, e, f, g, i, j, k & l**), consequently, it would be redundant for the reader.

NAME	LEVEL	YEAR	TYPE	ISSUES DETECTED
• Directive 2010/75/EU	Supra-national	2010	Directive	(a) 'Polluter pays' Principle and pollution's liability (b) Prevention Principle
• Law 5/2013 about Prevention and Integrated Waste Control	National	2013	Law	(c) Transposition of the EU Directive in Spain: same principles dismissed + small modifications from national previous law (d) Small modifications from Law 22/2011 and others
• Law 22/2011 about Waste and Contaminated Soils	National	2011	Law	(e) Need of updated regulations (f) It establishes the regulating framework for contaminated soils
• Royal Decree 9/2005	National	2005	Regulations	(g) The only specific regulation in force referred to soil contamination (h) It states the potential soil contaminating activities
• National Inventory of Contaminated Soils	National	1995	National Inventory	(i) No updated number of scenarios nor their characterization (j) Competences transferred to regions (CCAAAs)
• State Framework Plan for Waste Management (PEMAR)	National	(2016-2022)	National Plan	(k) Aim of a waste circular economy and more compliance among CCAAs (l) It assumes the lack of a unique supra-national reference regulation
• Waste Plan of the region of Murcia	Regional	(2015-2020)	Regional Plan	(m) No updated inventory of contaminated soils

Table 12. Issues detected through the legislation

- It was not possible to find any accessible regional inventory of contaminated soils for the region of Murcia, what gives a context of non-compliance of the national and supra-national legislation. **There is not even mentioned, in what is supposed to be the “road map” for the following years about waste management, anything specific about soil contamination or the extractive industry.** The Waste Plan of the region of Murcia (m) document is even more explicit: “For the case of Industrial and Commercial assimilable Waste there is no availability of the overall data of generation (...) This fact is one of the objectives to solve in the current Plan, in the way that applying the specific measures (...) it will be solved the lack of global information

that currently exist“ (CARM, 2015, pp. 46 – 47) **recognizing the regional Administration itself the lack of updated information.**

- In the local level, researching through the municipal Ordinances and Subsidiary Rules of the municipality of La Unión, it has been not possible to find any content or initiative regarding soil contamination or the bay of Portmán itself (it might be evident if not even the regional plan takes it into account).

Again the following table will highlight those needed indicators:

SELECTED FACTOR	CHOSEN INDICATORS	NATURE	CONTENT
• Legislation in force	✓ Legal link with the process of recovery	Qualitative	<ul style="list-style-type: none"> ✓ Supra-national and national main principles dismissed ✓ No consideration of soil contamination in the regional regulations ✓ No local regulations

Table 13. Chosen Indicators for the Legislation in force

D. Elements of cultural and natural heritage

This part of the characterization of the brownfield has a big influence in the possibilities and choices of redevelopment of a brownfield scenario, being most of the times linked with the local identity of the population, who tends put in value these assets, sometimes with not a big economic advantages, and normally opposed to those agents that are funding the process of revitalization, that aim to obtain economic benefits in a short-term period.

❖ *Cultural Heritage*

Due to the intensity of the mining activity in the area of Portmán, La Unión and the Mining Mountains, the following pictures show examples of elements and infrastructures from the mining activity that are considered cultural heritage. All this area is full of the rest of mining activities that have being done across time. The CLARINET network assumes: “*Many brownfield sites include old industrial buildings, which require maintenance under the special aspect of preserving the cultural heritage*” (CLARINET, 2002; pp. 61). Consequently it seems

that supra-national networks are aware of the importance if this heritage.

The images below represent examples of the abandoned mining infrastructures and buildings that are spread across the Mining Mountains and Portmán.



Figure 38..Images of singular elements of the Mining Mountains (source: Baños Páez, 2012; pp. 8-9)

Using a chart from the inventory developed by García García (2004; pp.138), and appeared also in PSMIII (being impossible to find an official inventory of the mining heritage) it is feasible to see the real scale of quantity of elements such as **Mining Structures** or **Heritage Sites** all throughout the Mining Mountains and Portmán. The 'X' axis displays the columns

(from left to right) of the: Mine Shafts **(1)**, Tailing Ponds **(2)**, Active Quarries **(3)**, Open Pits **(4)**, Archaeo-Mining Heritage Elements **(5)**, Geological Heritage Elements **(6)** and Archaeological Heritage Elements **(7)**. The total count of elements amounts to: 2654.

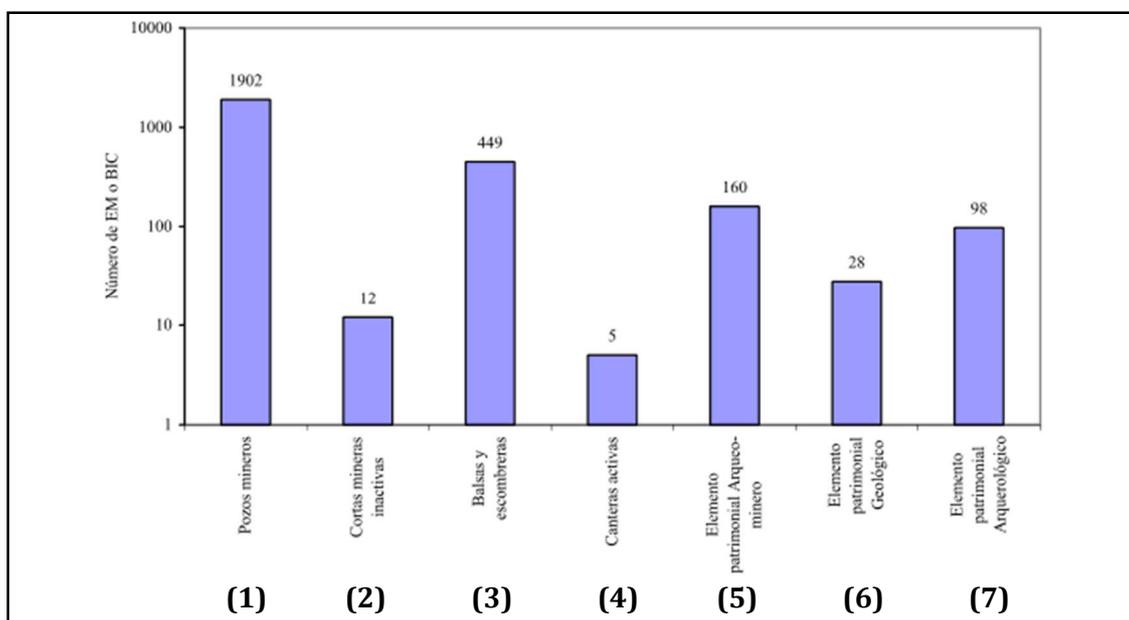


Figure 39. Distribution of the Ems and BICs across the Mining Mountains (source: García, 2004; pp. 138)

In relation with the initiatives put in practice by local groups, to defend and keep those elements that have been attached to the local way of life for many years, assuming the importance to recognize their 'value'. These initiatives are the following, based on Baños Páez (2012) words:

- All those elements that were typical from the mining landscape such as: buildings, chimneys, blast furnaces, roundhouses, etc. have been started to be recorded to declare them as Properties of Cultural Interest – Historical Place, approved in 2009 (Included in the database of the Ministry of Culture).
- It has been proposed that this area and its elements should be included in the Indicative List of the UNESCO Cultural Landscapes, being requested as well its declaration as World Heritage Site.
- It has been included in the Historical Mining Heritage, as well as other mining districts in Spain, as Historical Mining Heritage, in the Indicative List to be declared World Heritage, approved in 2006.

❖ *Natural Heritage*

The natural heritage has a similar understanding in terms of the local identity of an area with their characteristic **environmental assets and protected areas**. As it is mentioned at the beginning of this Case Study and inside the Land Use sub-section, the area of Portmán, apart from the evident mining legacy, it has some areas under special regimes of environmental protection: **Regional parks, SICs, SPAMIs and SPAs**, that might be needed to take into account for a proper project of redevelopment for the brownfield integrated appropriately into the site-context. These protection networks are national and supra-national.

First, **the regime of a regional park** is contained in the Spanish Law 42/2007 (BOE, 2007) defined as “*natural areas, not very transformed or exploited by human action, that, based on the beauty of their landscapes, the representation of their ecosystems or the singularity of their flora, fauna or their geomorphologic formations, has some ecological values, aesthetic, educational and scientific which maintenance deserves a preferential attention*” (García García, 2004; pp. 93). The existence of a regional park is effective in our Case Study surrounding Portmán in the East it is located the **Regional park of Calblanque, the Ash Peak and the Eagle Crag** (See Figure 40). In the website of the region is possible to check all those areas under special regime as a result of their environmental values.

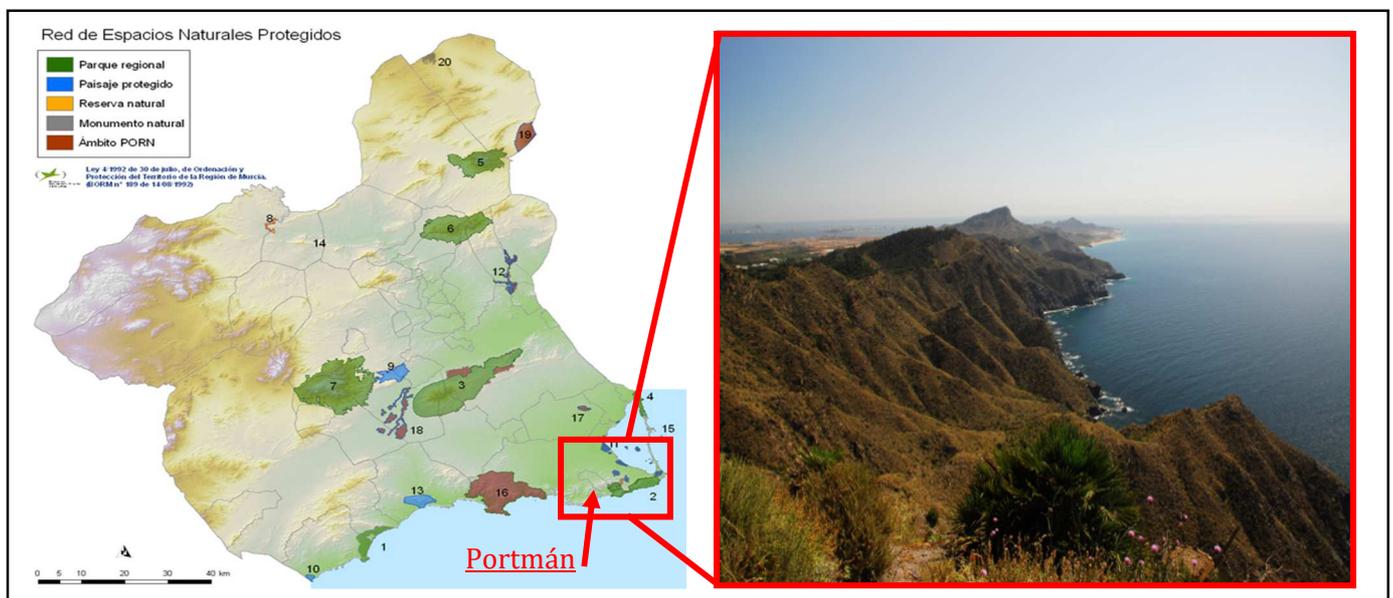


Figure 40. Natural Parc of Calblanque. Source: Red Espacios Naturales protegidos Murcia

In relation with other existing regimes in the area of Portmán that may influence the existing conditions for redevelopment, the EU has stated its network Natura 2000 (EC), with the

development of two main Directives: **Habitats Directive** (EC), designating **SICs** (Sites of Community Importance) & **SPAMIs** (Specially Protected Areas of Mediterranean Importance) among 9 biogeographical regions, in this case the Mediterranean one; and **Birds Directive** (EC), through the identification of **SPAs** (Special Protection Areas for Birds).

From the Geographic Viewer of the region (SitMurcia), it is possible as well to check the protected areas under the Natura 2000 program (See Figure 41 below). The area of Portmán has an important presence of protected areas:

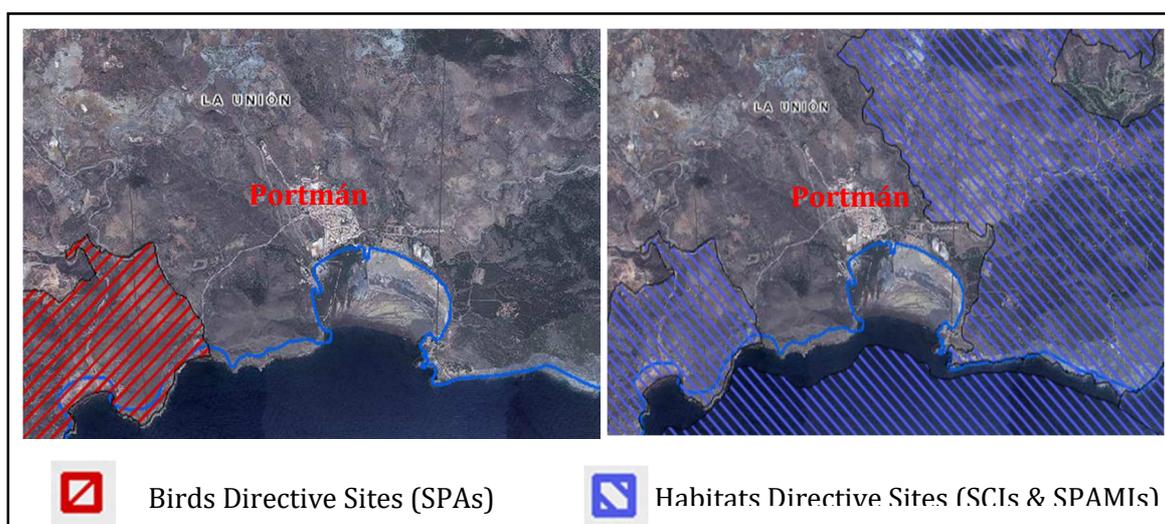


Figure 41. Details of the protected areas in the area of Portmán. Source: SitMurcia Viewer

Consequently, in the overall, the chosen indicators for Cultural and Natural Heritage are the following:

SELECTED FACTOR	CHOSEN INDICATORS	NATURE	CONTENT
• Cultural Heritage	<ul style="list-style-type: none"> ✓ Inventory of Elements ✓ Initiatives 	<ul style="list-style-type: none"> Qualitative Qualitative 	<ul style="list-style-type: none"> ✓ Existence, but not official ✓ Existence to include them in different list of Mining and Historical Heritage
• Natural Heritage	<ul style="list-style-type: none"> ✓ Existence of protected areas 	<ul style="list-style-type: none"> Qualitative 	<ul style="list-style-type: none"> ✓ Existence of protected areas under the regimes of: regional park, SCIs and SPAs

Table 14. Chosen Indicators for the Cultural and Natural Heritage

Phase (ii): Planning of New Uses

A. The last project of redevelopment for the brownfield: “A tiempo” (“On time”)

It is necessary to highlight the last project of redevelopment to identify possible elements that emphasized the appropriate and effective recovery of the brownfield in Portmán. Being the current case (repeated many times) an unresolved one, and consequently the last project no successful, it is going to be summarized through the two-folded categorization of Strengths and Weaknesses, stressing on those issues that played a positive or negative influence.

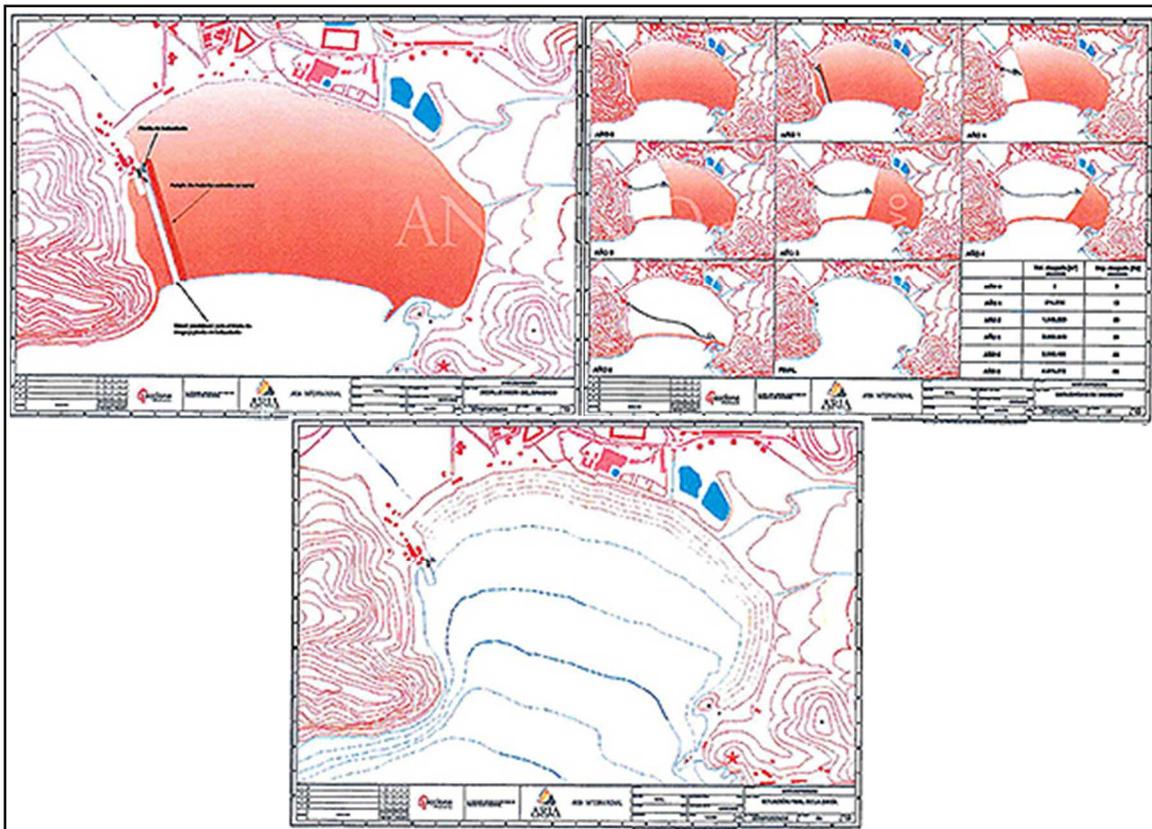


Figure 42. Maps of the project of redevelopment “A tiempo”. Source: Gómez Pérez, A; 2015

The last proposed project has been stated in 2013 by two enterprises so-called: ‘ARIA International’ and ‘ACCIONA Infraestructuras’ with the aim to remove and recover the steel minerals and pollutants located in the soil of the Bay of Portmán (Banos –Gonzalez & Baños Páez, 2013), following the steps showed in the Figures above. It is based on one of the previous redevelopment projects from 2011 with a specific objective: first to recover the old coast-line from 1957 (so getting back 700 meters of sea) and then recover well 20 meters of depth. But on the other hand there were important weaknesses that provoked

that all the neighborhood and local groups reacted against this initiative. Likewise the previous projects, it has several weaknesses that may put in danger the different contextual balances. Based on the explanation of Banos-González and Baños Páez (2013), the following table developed by the author in the PSMIII (González Carmena 2016; pp. 36), summarizes the characteristics of this project:

Strengths (4)	Weaknesses (9)
✓ Extraction of the sterile materials from the sea-bottom of the Bay	× Application from the two enterprises to occupy of a public maritime domain
✓ Get back 700 meters of sea, coming back to the existing coast-line in 1957, before the contamination of the bay	× No EEI – Evaluation of Environmental Impact
✓ Cleaning of 764.183 square meters on the sea level (red area <i>Fig. G</i>) + 497.943 square meters under the sea level (yellow area <i>Fig. G</i>)	× No clear economic profitability of the process (supposedly benefits are going to come from the cleaning of the Bay)
✓ Creation of 500 direct jobs + 1500 indirect jobs	× No funding from the EU
	× It is not the first project in this direction: the German multinational RWE proposed one in 1996; not approved
	× Convenience of the regeneration of a bay polluted as a result of mining discharges, through a mining concession and no through environmental restoration?
	× No clear existence of the specific quantity of materials that according to the enterprises are located in the bay (under the threshold of 10 ⁶ tons of magnetite, minimum quantity to consider profitable the construction of the whole infrastructure and facilities.
	× Doubts about the issues related with the transport of those extracted materials
	× Neighborhood groups are against this project, for all the previous reasons, among others. No agreement between stakeholders

Table 15. Strengths and Weaknesses of the “A tiempo” project, source PSMIII

The table below highlights the chosen indicators for the selected factor

SELECTED FACTOR	CHOSEN INDICATORS	NATURE	CONTENT
• Last Project of Redevelopment	✓ Costs	Quantitative	✓ Supposedly minerals coming from the removal of the bay would pay the costs
	✓ Funding	Quantitative	✓ There was no funding coming from the EU

Table 16. Chosen Indicators for the Last Project of redevelopment

B. Main agents implicated

The main agents or stakeholders implicated in the process of regeneration are crucial for the correct negotiation and implementation of a contaminated or derelict land, and usually their attitude or behavior against or pro a specific initiative or project or revitalization is understood as a drivers or barriers for this process as a result of their influence. Following the same intention than the rest of the document, the identification of the main agents/stakeholders implicated in the planning of recovery of the brownfield of Portmán is going to be indicative and non-exhaustive.

Based on the schemas of Banos-González & Baños-Páez (Quote 2013), the main stakeholders implicated in the process of recovery of Portmán can be categorized in four main groups: **Administration, Private Enterprises, Research Centers** and **Social Movements**. Each of them has a specific input in the process of recovery/blockage as well as interests based on principles that are easy to differ with among the different parts. With this premise it is evident the context of complexity regarding the existing bilateral relations and interconnections between the stakeholders. Being this phenomenon a causal problem, is among the different agents and their capacity to adapt themselves to a common purpose beneficial for the affected area, where most of the possibilities of recovery depend on. It doesn't matter if all the previous factors (Physical appearance, Land Use and Tenure, Legislation and Cultural and Environmental assets) are favorable for a proper improvement; if there is no agreement among the main agents implicated in the process, the other factors will be useless in practice. In short, the possibilities of success can increase drastically with the different implicated parts aiming a common and previously negotiated and agreed objective. The table below will show the different main actors/ agents/ stakeholders implicated directly or indirectly in the process of recovery of Portmán that have been mentioned all along this first Case Study.

Actors	Level	Group	Nature* (Indicator 1)	Role** (Indicator 2)
• Ministry of Environment	National	Administration	Public	<ul style="list-style-type: none"> • Maximum authority in environmental issues, prioritizing sustainable solutions in theory • No political will at some point
• Ministry of Public Works	National	Administration	Public	<ul style="list-style-type: none"> • Maximum authority in infrastructures • Public Authority that permitted the discharges of pollutants to the Mediterranean Sea
• Autonomous Community of Murcia (CARM)	Regional	Administration	Public	<ul style="list-style-type: none"> • Responsible authority for the development of inventories, plans of action, initiatives and legislation for BF regeneration • No political will at some point
• Town hall of La Unión	Local	Administration	Public	<ul style="list-style-type: none"> • Neutral entity in the negotiations between stakeholders, acting as a link between local groups and the Administration • Possibly influenced by economic interests, opposed to the environmental remediation of the Bay, so no political will at some point
• Portmán Golf S.A.	Local	Private Enterprise	Private	<ul style="list-style-type: none"> • Owner of 90% of the properties in Portmán and looking for economic profitability through urban reassessment • Not prioritizing environmental remediation
• University of Murcia - UCAM	Regional	Research Centers	Public	<ul style="list-style-type: none"> • Plenty of research and technical projects regarding Portmán • Crucial role in dissemination
• Ecologist Groups	National	Social / Environ. Groups	NGOs	<ul style="list-style-type: none"> • Responsible for the revelation and dissemination in the media of the Case of Portmán
• Social Collectives	Local	Social / Environ. Groups	Civil Associations	<ul style="list-style-type: none"> • Active participation in decision-making about projects of regeneration • Against projects that don't focus on the environmental remediation and looking for common benefit solutions strongly linked with the local identity

Table 17. Chosen Indicators for the Main agents implicated

The table above exposes **the main agents implicated (as the selected factor)** in the process of recovery of Portmán, directly as well as indirectly, as a result of their attitude and role in the decision-making processes. In conclusion, **both qualitative indicators (Nature* and Role**)** are stated illustrating the factor that was aimed to be measured.

Phase (iii): Execution of the new uses (Drivers and Barriers)

For the execution of the new uses, as the last phase of the sequential process, is going to be identified which of those selected factors, commented and illustrated all along this first Case Study through their chosen indicators, act as drivers for redevelopment (meaning that they influence positively the existing brownfield case) or by contrast as barriers (blocking and influencing negatively the process of recovery). Drivers and Barriers have been already mentioned and explained in chapter 3.1. Reminding the process with the objective of the identification of factors of success in the Figure above, this is the previous step before the Case Studies Comparison.

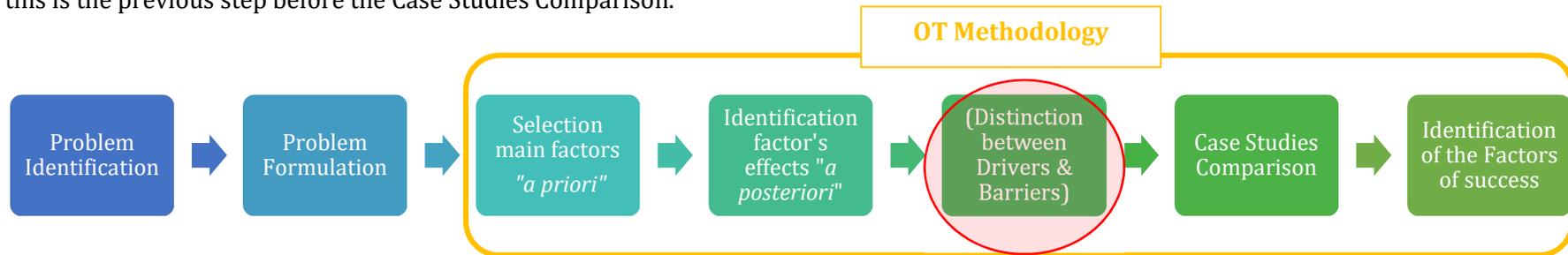


Figure 43. Sequential process embracing the OT methodology

The choice between both options is going to be in accordance with the facts or evidences identified throughout the development of the CS in all the previous phases. For a simple a correct understanding and identification, these issues are going to be displayed in a table (Table M) that will summarize the findings. A specific factor will be understood as Driver or Barrier depending on the effects exposed by their chosen indicators (therefore, it can be possible that a specific factor acts as both driver and barrier depending on the circumstances) and again the choice of indicators have been indicative and non-exhaustive. The corresponding findings belong to Phase (i) and Phase (ii), Initial Characterization of the brownfield and Planning of New Uses, respectively. Finally, those quantitative indicators (being the majority qualitative) are going to be included as well in the following tables, because they state qualitative consequences and being this two-folded distinction qualitative as such.

SELECTED FACTOR	CHOSEN INDICATOR	DRIVER?	REASON	BARRIER?	REASON
<ul style="list-style-type: none"> Physical Appearance 	<ul style="list-style-type: none"> Surface Polluted Volume of Pollutants Period of contamination Nature of the pollutants 	<ul style="list-style-type: none"> No No No Yes 	<ul style="list-style-type: none"> The high value of the metals contained in the sterile materials give the possibility of benefits for a potential project of recovery 	<ul style="list-style-type: none"> Yes Yes Yes Yes 	<ul style="list-style-type: none"> A whole bay is covered with waste from discharges (75 ha) The pollutants cover the bay from the sea bottom until the surface (60 million tons) A long period of permanent pollution, 31 years, state a complex and difficult scale for the cleaning The nature of the pollutants and the high concentration make them dangerous for the environment
<ul style="list-style-type: none"> Land Use 	<ul style="list-style-type: none"> Current Use of the Land 	<ul style="list-style-type: none"> No 		<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> Totally conditioned by the previously traditional use of the land, added to the rest that is protected due to environmental criteria
<ul style="list-style-type: none"> Land Tenure 	<ul style="list-style-type: none"> Owner of the affected area 	<ul style="list-style-type: none"> No 		<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> Possibilities of recovery pending on the private enterprise that owns more than 90% of the urban areas of Portmán
<ul style="list-style-type: none"> Legislation in force 	<ul style="list-style-type: none"> Under which legislation is depending the recovery 	<ul style="list-style-type: none"> No 		<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> Supra-national and national main principles dismissed plus no consideration of soil contamination at the regional level plus no local regulations
<ul style="list-style-type: none"> Cultural Heritage 	<ul style="list-style-type: none"> Inventory of elements Initiatives 	<ul style="list-style-type: none"> No Yes 	<ul style="list-style-type: none"> Existence of some initiatives to put in value the mining infrastructures as historical and cultural heritage 	<ul style="list-style-type: none"> Yes No 	<ul style="list-style-type: none"> No official inventory funded and published by the Administration
<ul style="list-style-type: none"> Natural Heritage 	<ul style="list-style-type: none"> Existence of Protected Areas 	<ul style="list-style-type: none"> No 		<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> The existence of protected areas with supra-national and regional influence restricts the recovery

Table 18. Identification of Drivers and Barriers Phase (i)

Phase (iii): Execution of the new uses (Drivers and Barriers)

➤ **Identification of Drivers and Barriers from Phase (i): Initial Characterization of the Brownfield**

SELECTED FACTOR	CHOSEN INDICATOR	DRIVER?	REASON	BARRIER?	REASON
<ul style="list-style-type: none"> • Last Project of Redevelopment 	<ul style="list-style-type: none"> • Costs • Funding 	<ul style="list-style-type: none"> • Yes • No 	<ul style="list-style-type: none"> • Supposedly payed from the extraction of the sterile materials located in the bay 	<ul style="list-style-type: none"> • Yes • Yes 	<ul style="list-style-type: none"> • No clear existence of the specific quantity of materials that according to the enterprises are located in the bay • The EU has rejected to fund the project
<ul style="list-style-type: none"> • Main agents implicated 	<ul style="list-style-type: none"> • Nature • Role 	<ul style="list-style-type: none"> • No • Yes 	<ul style="list-style-type: none"> • Variety of reasons but in general high level of implication by the local communities • Plenty of research and technical analysis from regional centers • Awareness of the importance of the case in the society 	<ul style="list-style-type: none"> • Yes • Yes 	<ul style="list-style-type: none"> • The entity that owns the majority of the terrains is private, conditioning potential redevelopment to their own interests • General lack of political will at every level of the administration • Conflict of interests between the private sector and the local groups • Local groups blocking initiatives that according to them are not adequate enough

Table 19. Identification of Drivers and Barriers Phase (ii)

➤ **Identification of Drivers and Barriers from Phase (ii): Planning of New Uses**

4.1.2 Confluence of the Tinto and Odiel rivers (CS2)

The second Case Study explores an example of chemical contamination in a natural area with the singularity to be close to a big urban agglomeration (the city of Huelva) in an area with high environmental values, as a result of the contamination during 40 years, affecting local habitats, water and citizens. Discharges have stopped due to the local pressures and recently project has been proposed to solve the contamination meaning a partial success.

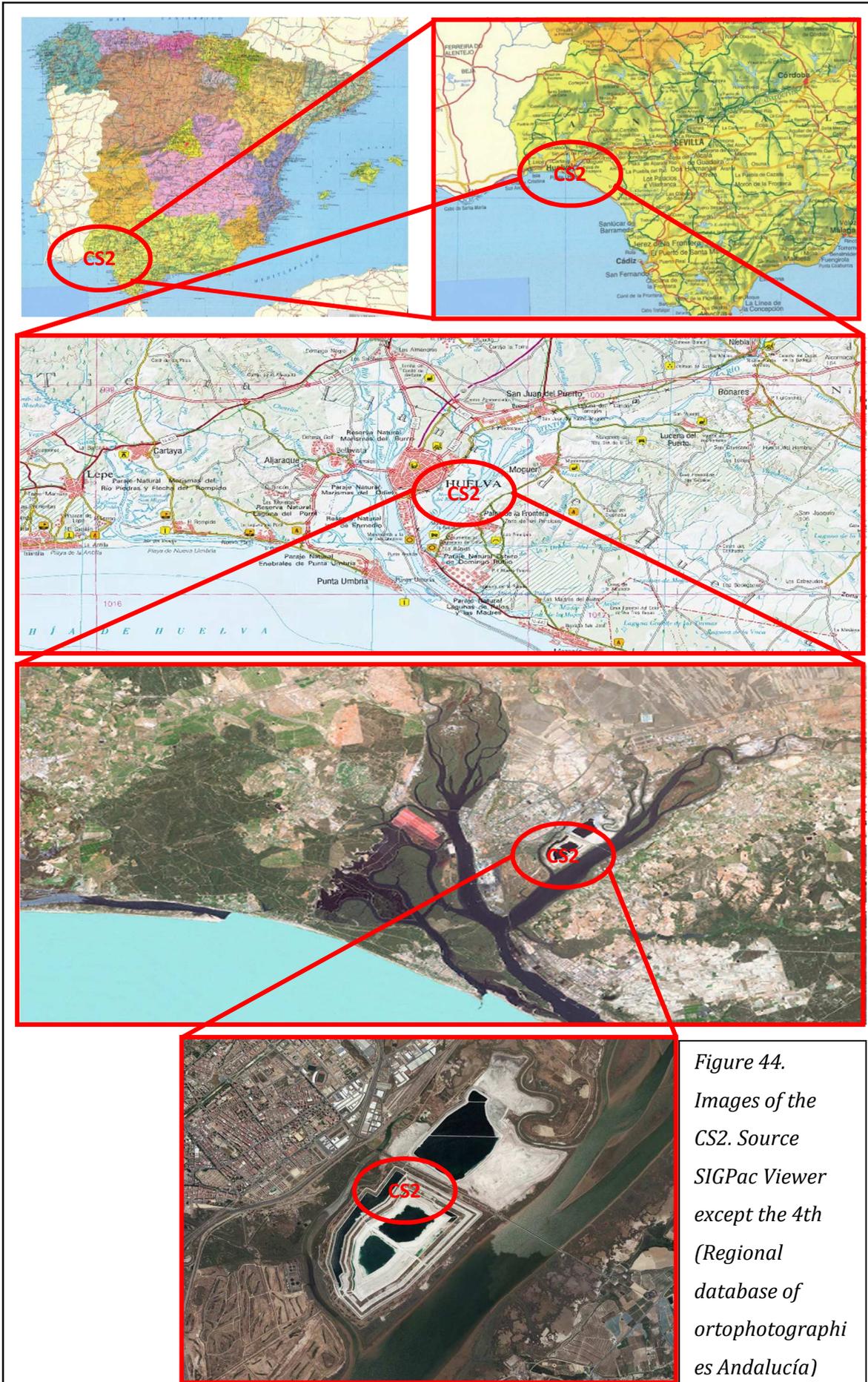
Phase (0): Contextual Study

C. Location and Justification

The confluence of the Tinto and Odiel rivers is located in the south-west coast of Spain, in the province of Huelva, region of Andalucía. This area of Spain has two main local characteristics: on one hand the tradition of mining activities at the beginning of the Tinto river and all along its river basin and the one from the Odiel river, starting before the roman civilization, what gave a context of intense mining activities and the establishment of chemical industries in the city of Huelva during the industrial revolution, to take advantage of the minerals extraction upstream, stating a productive model that shaped the conditions of a traditional underdeveloped area (Olías Álvarez et al., 2010). On the other hand the special local conditions in terms of environment and climate, the existence of a huge estuary as a result of this confluence as well as humid zones and marshlands and the proximity with the Atlantic Ocean, give a singularity context to the area.

Among the different existing factories included in this industrial complex, there has been specially one, located few hundred meters from the city of Huelva that has focused the center of attention due to the different contaminating activities that were going on and the strong social opposition and controversy that these activities have generated. This factory was (and still is) ruled by a Spanish enterprise called Fertiberia, specialized in the production of phosphoric acid (García Tenorio, 2016)

This case study is not located in the hotspots stated by supra-national agencies but has a huge relevance due to the importance of the environmental threat that has supposed 40 years of discharges and 120 millions of tons of toxic residues, located in deposits, ponds, piles in different marshlands of the sides of both rivers, in a radioactive cemetery of 1.200 hectares (Greenpeace-Spain, 2008). In addition, the existence of humid areas and marshlands in the surroundings of the city implies as well the existence of special habitats for birds, due probably to the proximity with the Natural and National Park of Doñana, declared World Heritage Centre in 1994 (UNESCO). The following pictures from the SIGPAC and regional database viewers of Andalucía, display the location of the CS2.



D. Case Study background

As it was done in the CS1, the emphasis in the past events is crucial to understand the current conditions and future possibilities of the brownfield.

- There have been already signs of mining activity specialized in metallurgy in the area of the Tinto river before the romans (Tartessian civilization during the Bronze Age, 2.000 b. C.), but in the course of the roman occupation, the extraction of minerals became important in the southwestern part of the Iberian Peninsula (Olías Álvarez et al., 2010).
- After many years of progressive decadence until the first half of the 18th century, the exploitation of mining demarcations started again all along the Tinto river Basin. It is in the 19th century, with the industrial revolution when the copper expanded its uses (apart of the traditional military one) with plenty of new applications in the electric industry. Also, it is necessary to underline the shift into the chemical industry as a result of the strong demand existing in the middle of the 19th century, increasing exponentially the production of sulfurs necessary for fertilizers, explosives, alkalis, etc., from the pyrite locally extracted (Olías Álvarez et al., 2010).
- Likewise it happened in the case of Portmán, the new open air techniques from external investors and chemical companies spread the mining activity all around the river basins of the Tinto and Odiel rivers for the extraction of pyrite and manganese. As a result, Huelva was the fourth harbor in importance in terms of maritime traffic reaching the second position later on (Olías Álvarez et al., 2010).
- During the 60s, and the new liberalizing politic of the Franco dictatorship, Huelva suffer a metamorphosis with the construction in the terrains between the harbor and the city of an Industrial Pole of Promotion and Development, so-called '*Polo Químico*' ('*Chemical Pole*'). Moving some of the mining infrastructures located upstream, taking advantage of the functionality of the area (Olías Álvarez et al., 2010). The choice of Huelva for the location of this industrial complex was due to different reasons: the existing high rate of unemployment, the close location of all the mining infrastructures, the geographic location of Huelva with a harbor with enough depth and the proximity with the Sahara (one of the main phosphate

providers) (García Vázquez & Tejera-Arcenillas, 2014) focusing on the chemical industry instead of the extraction of metals.

- The Fertiberia enterprise obtained the concession from the Administration for the waste discharges in 1968, and from then it started the contamination of the Tinto's marshlands and its riverbeds with tons of radioactive and toxic industrial waste called phosphogypsum (Greenpeace – Spain et al., 2011).
- In 1995 the Environmental Department of the regional government of Andalucía stated the “*Waste Reorder*” to reduce the contamination of the estuary of Huelva due to the lack of control from the Administration, shifting, instead of occupying new terrains with waste deposits, advising to continue discharging in the already existing ones, as height deposits, forcing to the enterprises to recover those terrains through their ‘*regrow*’. In addition the water from the phosphogypsum suspension had to be isolated and not being able to contact the river water, something that happened permanently (even breaking in 1998 one of the height ponds, discharging into the Tinto river 50.000 cubic meters of acid water, heavy metals and other toxic substances) (Greenpeace – Spain et al., 2011).
- In 1998 was declared the expiration of the concession of the discharges from the phosphogypsum factory of Fertiberia to the marshlands, announced from the Ministry of Environment, but the enterprise continued discharging until 2010. (Greenpeace – Spain et al., 2011).
- A resolution from the Supreme Court forced the enterprise to stop the discharges, pretending the enterprise to continue the activities until 2018. All of this, dismissing the expiration order from 1998, being the local communities and the local ecologists the only ones protesting against (Greenpeace – Spain et al., 2011).
- Finally there has been approved a project agreed between Fertiberia, the regional government and the Ministry of Environment that proposes to cover the phosphogypsum, without any effective de-contamination and restoration of the affected areas, an insufficient solution according to the local groups and the ecologists. The result of this disaster has been according to the three NGOs ‘Ecologists in Action’, ‘Greenpeace-Spain’ and ‘WWF’



Figure 45. First three Figures from Olías Álvarez et al., 2010; the one after Greenpeace-Spain; last one Mesa de la Ría

(Quote, 2011; pp. 2): *“1.200 hectares of deposit of toxic industrial waste, with an bigger extension than the city of Huelva itself (...) having devastated the majority of the marshlands of Tinto river, an area with high ecologic and biologic value (...) reaching the deposit ponds with the pollutants almost 30 meters of height with a total quantity of 120 million of tons of phosphogypsum (...)”*, In short: evident health problems, the loss of terrains with huge ecologic value and with a strong negative visual impact and landscape in the area.

Phase (i): Initial characterization of the brownfield (Current Status)

A. Physical appearance

As well as it happened with Portmán, this Case has numerous visual evidences that help to understand the importance and the scale of the problem. Being a different Autonomous Community than Murcia, the geographic services and the databases are exposed through different platforms and canals. Consequently through the visualization of historic aerial images coming from the Digital Photographic Library of the National Geographic Institute, is going to be displayed the evolution of the brownfield from 1945 until 2013 (See Figures 46, 47, 48 & 49). Figures 47, 48 & 49 are the composition of three aerial pictures merged by the author (taking into account the overlapping of the images) for a better photointerpretation of the contaminated area. Across those figure is easy to distinct the evolution of the size of the waste deposits located in the west riverbank of the Tinto river while the discharges were going on and how its junction with the Odiel river and the subsequent marshlands have changed across time, in an area that might been more protected from environmental threatening.

In addition, using the most recent aerial image from the PNOA program (Figure 51), is going to be visualized the current physical appearance of the confluence of the two rivers, the city of Huelva and the deposits of toxic waste, giving an overall idea of delicate environmental circumstances under which the city of Huelva is currently dealing with as well as the different characteristic elements that shape the current context of the brownfield.

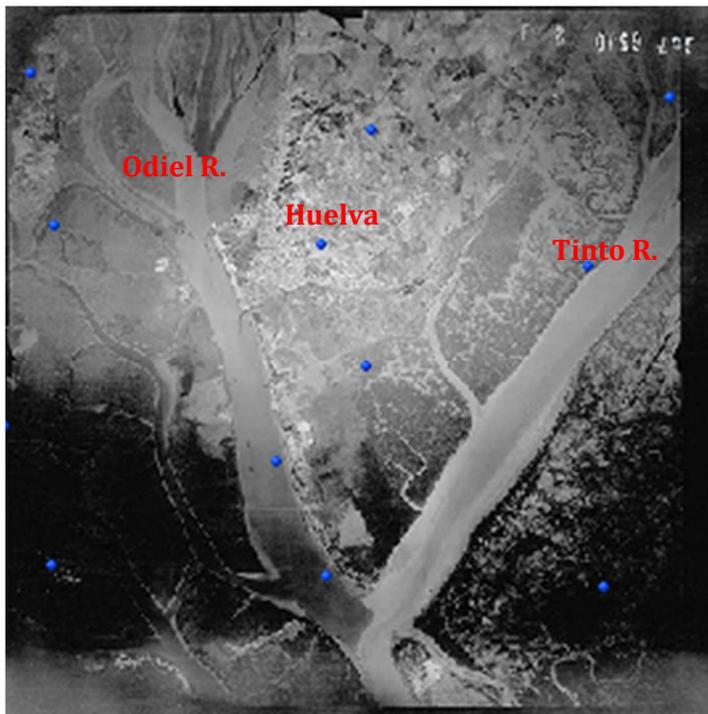


Figure 46
American Flight - A series
(1945-1946)

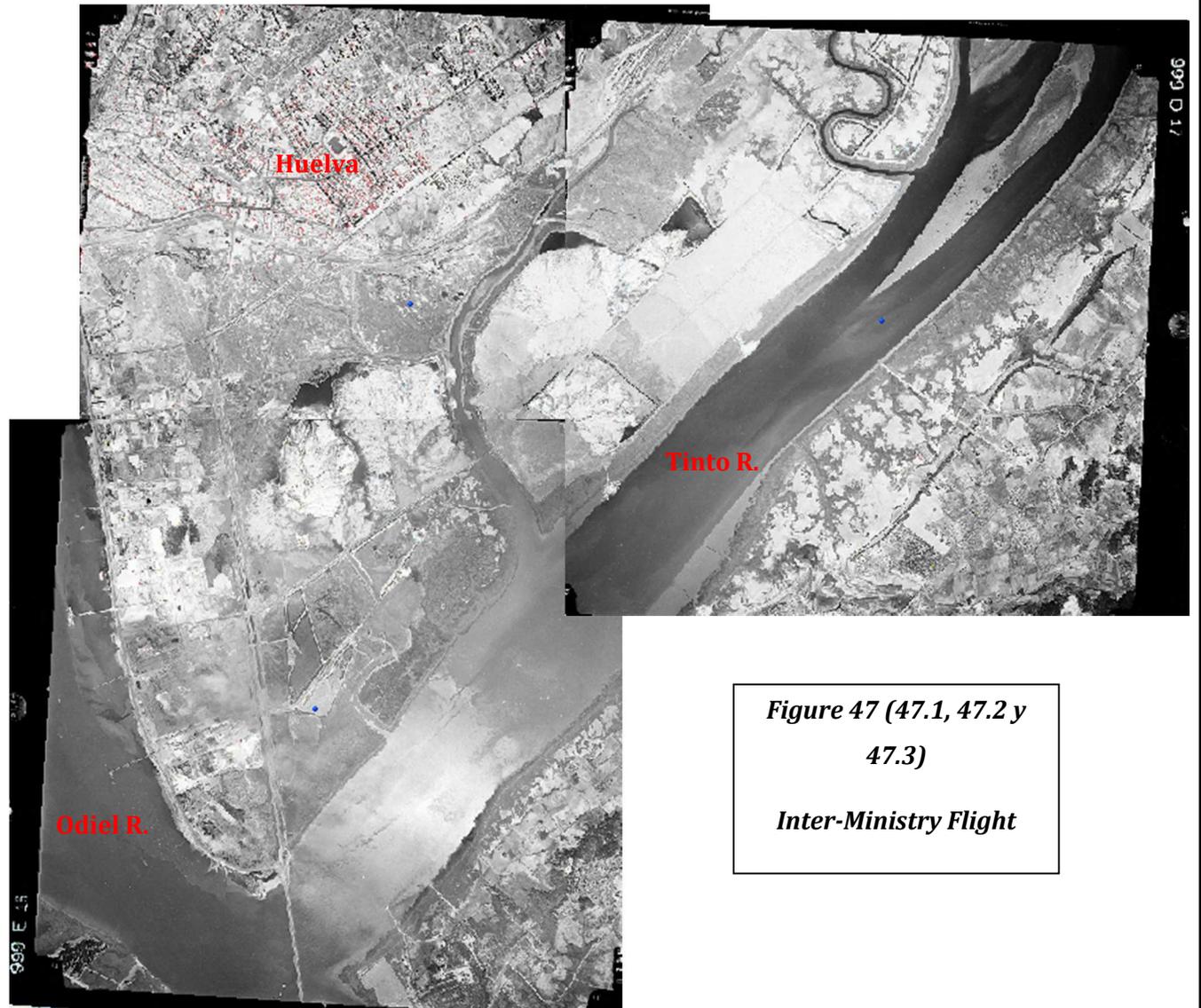
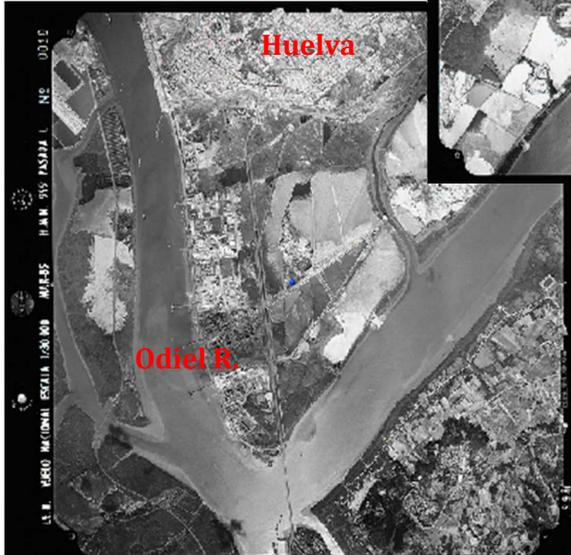


Figure 47 (47.1, 47.2 y 47.3)
Inter-Ministry Flight

Figure 48 (48.1, 48.2).

National Flight

(1980-1986)



**Figure 49 (49.1, 49.2,
49.3).**

PNOA Flight

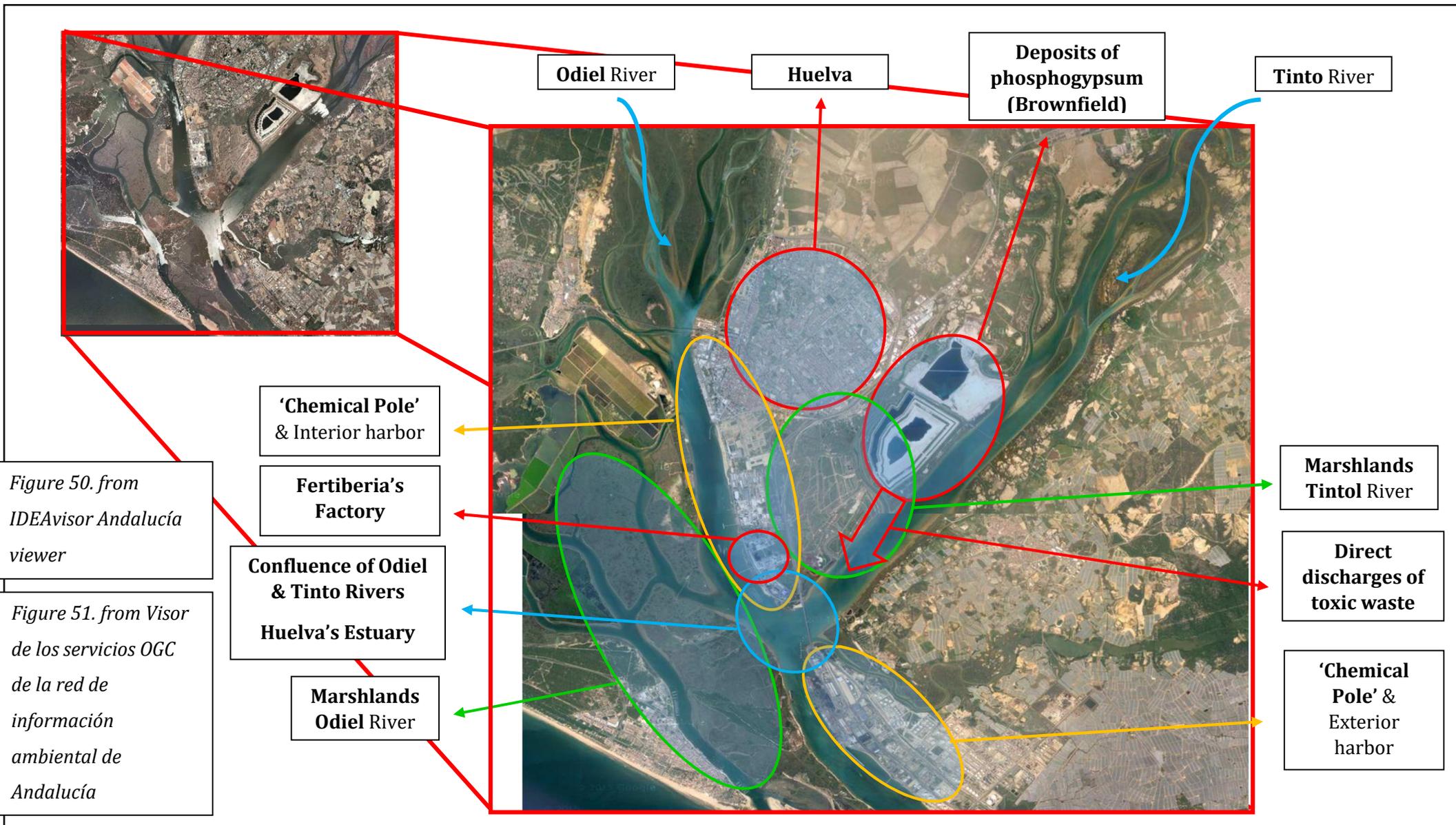


The Figures (46, 47, 48, 49) above show the evolution of the deposits of toxic waste in the riverbank of the Tinto River across time, as well as the exponential industrialization and edification of the city of Huelva, surrounded by humid and delicate natural habitats (marshlands) around the estuary.

Then Figure 51 displays the main existing elements of the area under concern, with the existence of the '*Chemical Pole*' between the protected areas and the city; the location of the deposits of phosphogypsum extended few hundred meters from households, and discharging pollutants directly into the river. The contamination is that evident that is even possible to identify the discharges looking into the tone of the water after and before the toxic ponds. Also it is easy to see how this discharges are transported directly to the marshlands through the water stream, first the one located between the deposits and the industrial area in the corner of the estuary; and then the marshlands located just in front the two industrial areas, continuing those toxic components directly to the Atlantic Ocean.

In summary there is a complex context conditioning this case study, with delicate and sensitive environmental balances merged with an active and intense industrial activity and the location of a city with more than 100.000 habitants. With an appropriate and detailed legislative framework and the compliance from the different actors of this framework there might not be any environmental threatening, but is not the case, prioritizing the benefits and inputs-outputs from the industrial activity than a respectful behavior with first, local citizens, and then environmental and landscape assets existing in the area.

In relation with the indicators belonging to this phase, few of them have been already mentioned in the sub-sections above. Those quantitative ones reflect a bigger scale than **CS1**. These indicators are the following: the surface of contamination has been **1.200 hectares of toxic waste** located in the deposits (with their corresponding filtering into the aquifers, marshlands and estuary); then the total volume identified of pollutants was **120 million tons of phosphogypsum** placed in the waste ponds. Then, regarding the nature of the pollutants involved, the factory of Fertiberia was producing phosphoric acid for chemical fertilizers from phosphate rock coming from Morocco; from this production, there was created also a sub-product called **phosphogypsum**, enriched and composed by **natural radioactive substances** such as radionuclides (mainly Radium) (García Tenorio, 2016) as well as **radioactive isotopes** such as Uranium 238 that is disbanded into other radiotoxic elements such as Th-230, Ra-226 or Po-210 (Greenpeace-Spain, 2008). Those deposit ponds were not waterproofed, producing a primary contamination through permanent discharges, leaching and filtering of acid and contaminated water with heavy metals to the mentioned aquifers and the estuary of Huelva



- *Figure 50. from IDEAvisor Andalucía viewer*

- *Figure 51. from Visor de los servicios OGC de la red de información ambiental de Andalucía*

until the coast of the protected area of Doñana transported by the coast dynamics (secondary contamination) (Mesa de la Ria, 2007) Also there is present the tertiary contamination through the wind, transporting dust from the deposit ponds.

The period of contamination of this specific factory producer of the fertilizers (and directly liable for the contamination due to the deposits, discharges and filtering) started as soon as the concession from the Administration was effective in 1968 lasting during **more than 40 years of discharges** until 2010 (even with the concession period having expired since 1998), with a yearly production of 2.5 million of tons of phosphogypsum (Comisión de Expertos, 2009).

This case study focuses in this factory of Fertiberia, but it is necessary to insist that other factories and big enterprises have been related with other cases of contamination, discharges and filtering, making a dangerous and delicate area, with the treating, production, storage and transport of toxic substances. For example illegal discharges in the deposits of phosphogypsum of other toxic waste (weak acids) with high composition of heavy metals such as Arsenic, Cadmium, Lead and Zinc (Greenpeace-Spain, 2008).

The following table summarizes the abovementioned indicators:

SELECTED FACTOR	CHOSEN INDICATORS	NATURE	CONTENT
<ul style="list-style-type: none"> Physical Appearance 	<ul style="list-style-type: none"> ✓ Surface of Contamination ✓ Volume of the pollutants ✓ Period of Contamination ✓ Nature of the pollutants 	<ul style="list-style-type: none"> Quantitative Quantitative Quantitative Qualitative 	<ul style="list-style-type: none"> ✓ 1.200 hectares ✓ 120 million tons ✓ 42 years ✓ Natural toxic and radioactive sub-products from fertilizers production

Table 20. Chosen Indicators for the Physical Appearance

E. Land Use & Land Tenure

There are my issues related with the land use, land tenure and the contamination of the estuary of Huelva, but focusing on the deposit of toxic waste from Fertiberia (the brownfield under analysis) it has been found out while the process of research that the area where the toxic waste was stored had a huge complexity in terms of use of the soil occupancy, tenure,

rights of use, etc. For a clear understanding, and following the different reports developed by the polluting enterprise, the local communities and the experts Committee (Mesa de la Ria, 2015), they divided the area in 5 different zones, each of them having different regimes and regulations in force. The following images display first the area under concern, before the industrial implementation of Huelva (left) and the current sub-division of zones as a result of the different ways, period and regimes in force while their contamination (right) has been achieved:

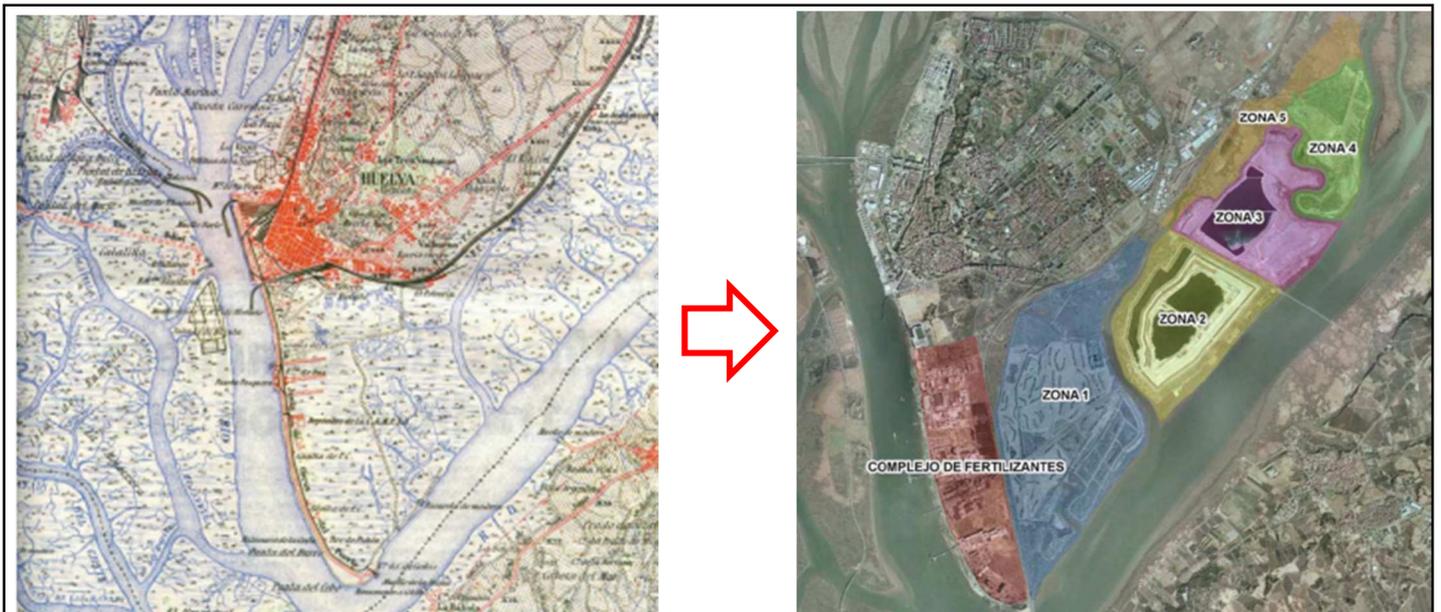
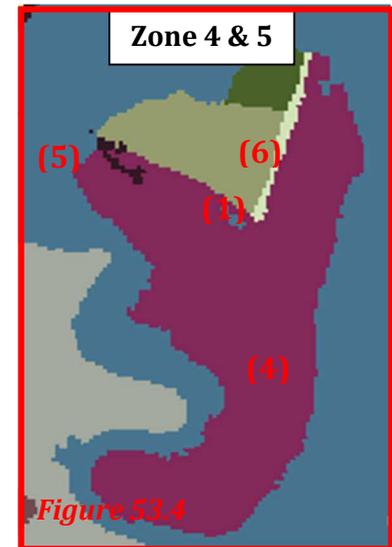
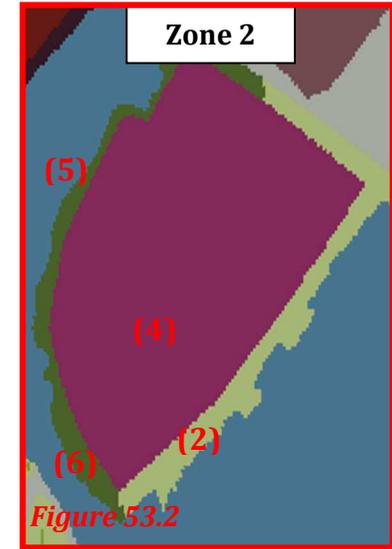
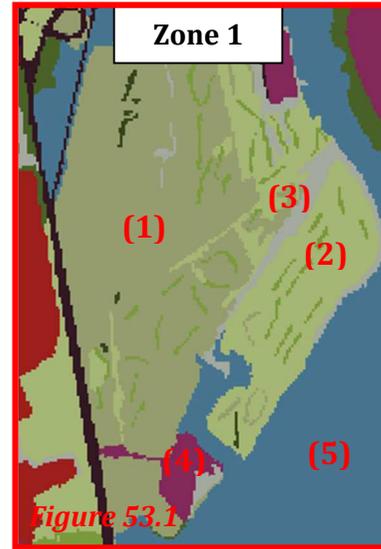
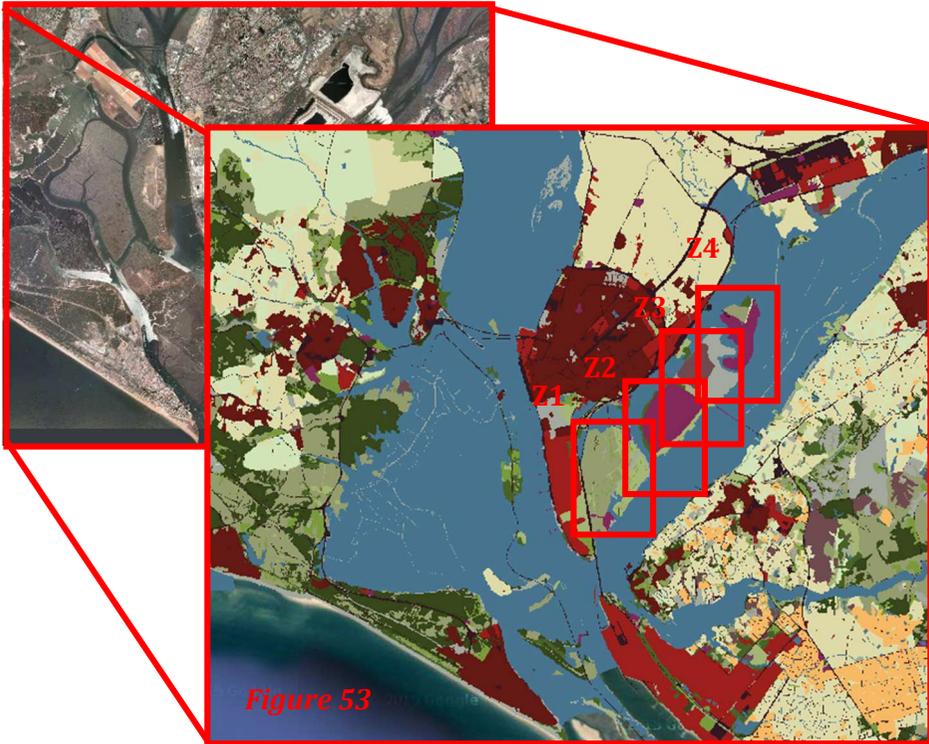


Figure 52. The Tinto Marshlands. Source: Mesa De la Ria

Having each of the Zones a specific threatening, period of contamination, conditions and owner, for an appropriate understanding, it is going to be explained first the *'theoretical'* use of the land according with the SIOSE program (already used in the previous Case Study), in short, the soil occupation from 2011 (the most updated one in Andalucía); and then the real actions, transactions and use of the land *'in practice'* showing a context where: *"The implementation in 60's of the fertilizer industry as the referred to Fertiberia and its phosphogypsum discharges initially to the Odiel estuary, and afterwards with direct discharges to the marshlands of the Tinto River, was produced by the reduced social or even scientific assessment that in those years had these spaces, considered nowadays as high ecological, landscape, cultural and environmental value"* (Ria de la Mesa, 2015; pp. 27). First, the identification of each zone:

- Zone 1 (Blue): 'El Pinar' Marshlands
- Zone 2 & Zone 3 (Yellow & Pink): 'El Rincón' Marshlands (Phosphogypsum ponds)
- Zone 4 (Green) & Zone 5 (Orange): 'Mendaña' Marshlands



Soil Occupation SIOSE 2011

- | | |
|-------------------------------|----------------------------|
| (1) Scattered Woodland Scrub | (5) Humid areas |
| (2) Meadows with clearings | (6) Woodland Meadows |
| (3) No Vegetation | (7) Industrial/Mining Pond |
| (4) Technical Infrastructures | |

Source: Visor de servicios OGC dela Red de información ambiental de Andalucía

As it can be seen in the previous page, the official occupation of the soil in the affected areas are in simple and basic categories of meadows, scrubs or area with no vegetation, but all of them surrounded and embraced by **humid zones (marshlands)** that occupy the majority of surface of Huelva's estuary. It takes the attention those areas in zone 2, 4 & 5, for technical infrastructures, that are actually in practice deposits and dumps of toxic waste. The same happens in zone 3 where less than a half of the surface is recognized as Mining/Industrial Pond, being the rest of the zone declared as '*No Vegetation*' but having the same nature and characteristics in practice than soil (7). **In summary it seems that there are several gaps related with the theoretical soil occupation and the one applied in practice, through what it might be an evident environmental threatening.**

For this Autonomous Community of Andalucía, there was no availability of information of the soil zoning in any of the regional geoportals or geographic viewers, as it happened in the CCAA of Murcia in CS1. All of them are written and published in the different Plans of varied nature approved in the subsequent hierarchical scales. For this reason, the information related with the real use of the soil '*in practice*' was obtained from the different reports and allegations presented by the local community '*Mesa de la Ria*' ('*Table of the estuary*'), a very active group mentioned before in this case study, that has played a key role in the protests against the environmental threatening that Huelva has been suffering, in conjunction with the ecologist groups.

Before starting the explanation of each zone of the affected area, it is needed to remind 2 past general and necessary facts:

- In the 60's the government of Franco stated 2 plans of development and industrialization in Spain establishing 7 industrial poles including Huelva and other 5 between 1964 and 1972 (García-Vázquez & Tejera-Arcerillas, 2014). Since that moment Fertiberia has its own surface for the construction of the industrial infrastructure, located in the northern corner of Huelva's estuary, limiting directly with Zone 1, being close from the urban area and surrounded by wide marshlands (see old Figure above).
- The occupied surface for the deposit of the toxic and radioactive waste (zones 1, 2, 3, 4 & 5) is considered as **public terrestrial-maritime domain and public port domain** which concession to Fertiberia S. A. was produced in 1968 by the old Ministry of Public Works & Transport (Comisión de Expertos, 2009). **Marshlands can't be used for any purpose or use differing from the one brought by its own nature** (Mesa de la Ria, 2015). **Was this concession appropriate?** It was the same

public entity that conceded the permission for the discharges in the Bay of Portmán.

Focusing then in the different Zones previously identified of the brownfield:

- **Zone 1:** This area is the closest to the Industrial Pole, public terrestrial-maritime domain managed by the Harbor of Huelva (municipal level) as well as some competencies from the Coasts General Directorate (national level, depending on the Ministry of Environment). It has been the first of the five zones to be polluted since the dictatorship of Franco until the mid-90's (Mesa de la Ría, 2007), where there have been **discharged phosphogypsum and pyrite**. Then the regional government "*restored*" in 1995 the affected area through the "*only alternative*" of **covering the polluted area with 30 cm of soil, dismissing completely the "polluter pays principle" and being funded with money coming from the public funds** (Mesa de la Ría, 2015) with a cost of almost 11 million Euros (Junta de Andalucía, 1996). Nowadays it is a high polluted land (confirmed by the CSIC, Spanish National Research Council), where pollutants flow and move without any official declaration of contaminated area from the authorities; area forbidden for citizens due to its surface instability.
- **Zones 2 & 3:** Is the only area where there has been proposed recently a project of remediation (no project in Z1, Z4 & Z5). The concession of the deposit of toxic waste from the regional government to the enterprise Fertiberia has a hidden authorization of liquid discharges by the regional government of Andalucía (Mesa de la Ría, 2015). **This authorization was conceded without the concession of the occupation of the state public domain with a liquid discharge of phosphogypsum that were laid down on solid materials, shaping illegal pyramidal ponds increasing until a height of 25 meters over the level of the marshlands in this 2 zones in a soil where the regional government didn't have any competencies** (Mesa de la Ría, 2015) lasting for more than 40 years as it has been mentioned in the background study. The advantages for Fertiberia were based on the low costs that suppose the discharges through pipes directly from the factory, postponing the waste problem for the future generations, being the enterprises not able to reuse or reduce and recycle the toxic waste which are simply abandoned (Mesa de la Ría, 2007). The project of remediation recently presented is going to be commented later on in Phase (ii).
- **Zones 4 & 5:** In practice is the same area, but: on one hand, Zone 4 had a chaotic and

irregular management, being subleased illegally from Fertiberia (they did not have any competency for that) during many years to the regional government and other entities through the parallel public enterprise so-called EGMASA (Enterprise for Environmental Management) working for the regional government. Zone 4 was managed by EGMASA, creating a Centre for Inert Recovery (CRI-9) when in reality it was **a non-declared dumping site of chemical toxic residuum coming from the rest of Spain and Europe** (Mesa de la Ria, 2015) being closed down afterwards when it was **not even declared the existence of the dump itself or the contaminating soils, with the condescendence of the Town Hall of Huelva and Regional Department of Environment** (Mesa de la Ria, 2015). Currently, there is no aim or estimation to restore or remediate this area from Fertiberia. Again “*polluter pays*” principle dismissed. On the other hand, Zone 5 was contaminated illegally by Fertiberia, considering the area as dumping site as well.

Summarizing, due to the chaotic amount of information coming from different sources (ideal to facilitate that the responsible enterprise would not have any consequence as a result of its actions, using and contaminating always a public domain land with the consent of the different Administrations) , the indicators (displayed in the table below) from this selected factor can be underlined without separating the sub-sections of land use and land tenure: Primary, **the use of the land has been developed completely under the interests of the Enterprise Fertiberia through the abovementioned concession in 1968 from the Ministry of Public Works and adapted as a result of the different environmental threatening to favorable conditions for the polluter with the condescendence of the Administration at all levels;** secondary **the regime of the contaminated area was under the consideration of terrestrial-maritime public domain** (being all marshlands before), consequently, none of these activities and actions should have been achieved under the current legislation and it would require penalties for the polluter enterprise and the responsible Administration.

It has not being possible to discover the exact timing of the pollution and use of the different zones identified, but it seems that it was a progressive contamination and fraudulent use of the land that has being developed until the available public land was exhausted. Also, it may be impossible for the enterprise to assume alone all the costs of recovery, not only due to the high costs, but also because of the fact that the Administration has been jointly responsible of the damaged caused.

SELECTED FACTOR	CHOSEN INDICATORS	NATURE	CONTENT
• Land Use	✓ Current Use of the land	Qualitative	✓ Contradiction between the official use of the land and the polluting one developed in practice
• Land Tenure	✓ Owner of the affected area	Qualitative	✓ All the brownfield were marshlands, under the regime of terrestrial- maritime public domain, modified through fraudulent concessions and subleases

Table 21. Chosen Indicators for the Land Use & Land Tenure

F. Current legislation in force

From the available literature and sources of information related with the case, is convenient to insist the wide list of examples of non-compliance of the national and regional legislation related with different disciplines (human health, territory, waste management, land use, protection of the environment, illegal discharges, etc.), are chaotic and very extended, since, the creation of the '*Chemical Pole*' until nowadays, registered in the different documents presented by the social and ecological collectives (Mesa de la Ria, 2007 & Mesa de la Ria 2015). Those non-compliances may be directly responsible for the lack of control, gravity and interpretations of the existing legislative framework in force that made until now effective the conflict of the contamination of the marshlands in Huelva. **The existing legislation, with its characteristic gaps, might been able to stop or at least reduce the process of the discharges and their deposit in the past, but apart of a legislative framework there was needed a compromised Administration with a real an effective political will.**

As a result, being a case that is still unresolved as well, but containing at least the approval of a plan that is supposed to be negotiated now with the different stakeholders (see Phase (ii): Last project of redevelopment), in this sub-section are going to be underline some main indicative principles that shape the current legislative framework for brownfields and waste that should have been respected and complied. These indicative issues related with

the legislative framework, the concession of discharges given in the past to Fertiberia and the non-threatening of the area of the brownfield are exposed with the following examples at each level:

- The **evident non-compliance of the EU “Polluter Pays” and “Prevention” principles**, having the enterprise rejected the possibility of a real cleaning and environmental restoration of the different contaminated zones as soon as the deposit of one of the Zones (1, 2, 3, 4 and 5) was exhausted (Mesa de la Ria, 2007). The same happens with the national legislation transposed from the European Directives.
- The regional government of Andalucía states, in accordance with the national legislation, a hierarchy for the different options for waste management (Prevention, Preparation for reuse, Recycling, Energetic Assessment and Removal) Based on the evidences and facts, in the brownfield of Huelva there has been an only focus in an **ineffective enclosure and isolation of the toxic pollutants**.
- In a regional level, the P.O.T.A (Plan Ordenación del Territorio de Andalucía, Spatial Planning Plan of Andalucía) approved in 2006, establishes as a fundamental component the territorial structure of the region and its regional articulation for those spaces belonging to the natural or cultural heritage. **This plan qualifies the Tinto and Odiel Marshlands as Public Hydraulic Domain**, including them as proposition as SICs (see Natural heritage) (Mesa de la Ria, 2007). **In short, the concession doesn’t fulfill the limitations stated by the P.O.T.A.**
- At the regional level as well, the Law of Urban Planning of Andalucía (L.O.U.A 7/2002) establishes clear limitations as well as the protection and the adequate use of the coast, allocating its uses to open spaces and public leisure, permitting actions that won’t compromise the future use. **The discharges have conditioned future uses of a terrestrial-maritime domain**, with clear references from the CSN (Nuclear Security Council) and the CSIC (Higher Council of Scientific Research). (Mesa de la Ria, 2007).
- In a local level, the General Plan of Urban Planning of Huelva (PGOUH) designates the Zones 1, 2, 3, 4 y 5 as green belt, for being a **Natural Space, supported by the regional legislation** (Mesa de la Ria, 2007).

These are just few indicatives examples of non-compliance of evident and clear regulations, that state the question of the real political will from the Administration and the interest existing linked with the multinational Fertiberia.

As a result the chosen indicators are resumed:

SELECTED FACTOR	CHOSEN INDICATORS	NATURE	CONTENT
• Legislation in force	✓ Link with the process of recovery	Qualitative	<ul style="list-style-type: none"> ✓ Supra-national and national main principles regarding contamination is not respected ✓ The regional multidisciplinary legislation is not respected ✓ The local regulations regarding urban planning and land use are not respected

Table 22. Chosen Indicators for the Legislation in force

G. Elements of cultural and natural heritage

The area of the brownfield itself and the surrounding ones have many natural and environmental assets, with protection regimes at regional and supra-national level (Natura 2000). For example, the Odiel Marshlands have been declared Biosphere Reserve for their high ecologic value that they possess and because they have been able to keep intact until now due to their distance with the 'Chemical Pole' of Huelva and they have not being used as industrial toxic and dangerous waste dumps.

The estuary of Huelva is the consequence of the tide interaction and the action of the sea with the confluence of the Tinto and Odiel rivers, shaping one of the most important marshlands ecosystems in Europe (Mesa de la Ría, 2007). In this ecosystem cohabit different spaces with a very high ecological values nowadays threatened by the well-known industrial activity such as:

- The already mentioned Odiel Marshlands, declared Biosphere Reserve by the UNESCO, catalogued as SPA (Special Protection Areas for Birds), included in the RAMSAR convention (protection of wetlands) and protected by the own Regional Government of Andalucía as 'Natural Spaces' (Consejería de Medioambiente).

- The Integral Reserves of ‘Burro’ Marshlands and the ‘Isla De Enmedio’ Island, located in the surroundings of the Odiel Marshlands.
- In the Tinto basin, the Natural Location ‘Estero Domingo Rubio’, ‘Mendaña’ Marshlands (the already mentioned Zones 4 & 5).

The pictures below obtained in the REDIAM Geographic Viewer (from the Network Environmental Information of Andalucía) show the location of those protected areas around the brownfield of Huelva, all along the Odiel Marshlands and even including some of the polluted ones in the riverbank of the Tinto R., reason that gives more emphasis for an appropriate environmental remediation.

Apart the natural locations, the estuary of Huelva has important historic and cultural heritage such as: the Columbus locations, ‘Saltés’ Island with a whole Islamic city still to be dug out and the harbor of ‘Palos de la Frontera’ headquarters of the Columbus Locations. In addition, is true that there was plenty of mining activities upstream the Tinto River and these extractive activities conditioned (as well as it happened in Portmán) the opportunities of the productive activities downstream, but their location is far enough from the brownfield and the ‘Chemical Pole’ to consider that their inventory and restoration is going to have a direct impact in the estuary of Huelva through an integrating project of redevelopment.

SELECTED FACTOR	CHOSEN INDICATORS	NATURE	CONTENT
• Cultural Heritage	<ul style="list-style-type: none"> ✓ Inventory of Elements ✓ Initiatives 	<ul style="list-style-type: none"> Qualitative Qualitative 	<ul style="list-style-type: none"> ✓ Existence of old mining evidences but far away to affect directly the recovery of the brownfield through their inventory ✓ Idem. Successful initiatives of recovery and emphasis on the historical and cultural issues with the creation of a Mining Park
• Natural Heritage	<ul style="list-style-type: none"> ✓ Existence of protected areas 	<ul style="list-style-type: none"> Qualitative 	<ul style="list-style-type: none"> ✓ Existence of many protected areas with regional and international regimes

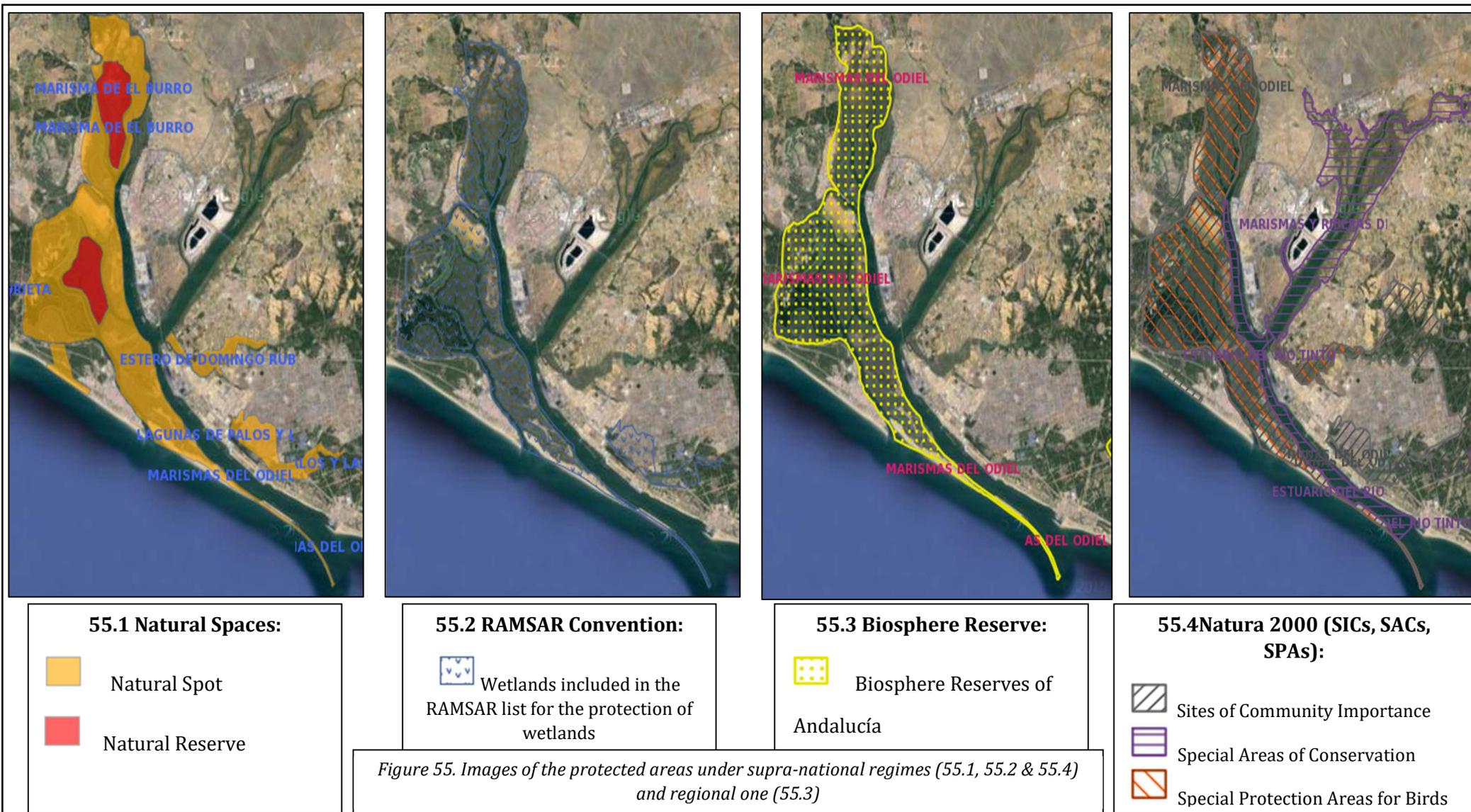
Table 23. Chosen Indicators for the Cultural and Natural Heritage

Figure 54. Images of the protected areas that surround the brownfield of Huelva

From up to down and left to right: Burro Marshlands, Odiel Marshlands (x2), Isla de En medio (Ventana Visitantes Junta de Andalucía); Isla de Saltés y Caravelas

(Lararquitectura.com & Andalucía.org)





Phase (ii): Planning of New Uses

A. The last project of redevelopment for the brownfield

The case of the phosphogypsum factory of Fertiberia provoked a huge social consciousness and fight for the protection of the environmental assets that has been characterizing this area across time, as part of the local identity (as well as it happened with the mining heritage in Portmán), reporting against the polluting enterprise permanently in junction with the ecologists groups, in a context where the Administration at every level had a direct responsibility for all the damages caused, permitting the Ministry of Environment and the regional government of Andalucía the non-compliance of European laws, sentences and verdicts. (Greenpeace-Spain, 2014). Assuming that the consequences related with the toxic waste will have a long term impact at different levels (food chain, vegetal habitats, quality of the water and health of the population, among others).

It seems that **after many years of environmental threatening with impunity**, and with different verdicts from courts condemning the discharges and the contamination, the problem is still not successfully solved, but some steps have been done for the restoration of the area. As it is commented in the background study, a first obstacle for the enterprise was in 1998, when the Coasts General Directorate (depending on the Ministry of Environment) initiate an **expiration file for the concession of the discharges** occurred from 1968 (Ecologist in action, Greenpeace – Spain & WWF-Spain, 2011). There was also a sentence in 2010 of the Supreme Court obliging the enterprise Fertiberia to stop its direct discharges to the marshlands of the Tinto River, stating a **partial victory** for a hugely damaged area due to contamination issues, with the highest rate of mortality in Spain due to cancer (direct relation with the toxic contamination?). This sentence was produced as a result of years of confrontation, protests and fight from citizen and ecologist collectives against “*the highest case of industrial contamination in Europe*” (Greenpeace-Spain, 2014). But in practice, until 2009, WWF-Spain doesn't obtain the way to make effective the execution of the expiration statement for the concession of discharges (11 years after, and continuing the enterprise its process of contamination) through judicial order from the National High Court (Ecologists in action, Greenpeace – Spain & WWF-Spain, 2011).

Other complains from these collectives have been done to the European Commission, the European Parliament and the Ombudsman's office (Ecologists in action, Greenpeace – Spain

& WWF-Spain, 2011).

Recently, the responsible enterprise for the pollution, **Fertiberia**, **has arrived to an agreement with the Spanish State (Coasts General Directorate and the Ministry of Environment) for the restoration of the ‘El Rincón’ Marshlands (Zone 2 & Zone 3)**, considering the enterprise that Zone 1, 4 & 5 don’t need any recovery, after solving through fraudulent agreements and considerations or just covering the toxic residuum with some centimeters as a really basic and short-term solution that doesn’t recover the damaged area at any point (Mesa de la Ria, 2015).The agreement officially presented is a basic project lacking details such as the funding and the costs, or the exact ways of drainage of the pollutants, having probably the whole project only the interested parts. The details published by the media and the quantity of reactions against through official pleas from the social and ecologic collectives, state the question about its content and have stopped the process with the Ministry favorable for this solution (**important to take into account that the current Minister of Environment was working for Fertiberia before**). The enterprise liable for the contamination published in 2015 a video on different public platforms explaining briefly the measures of remediation and restoration that have been approved in agreement with the American enterprise Ardaman & Associates INC, with the acceptance of the Ministry of Environment (Greenpeace –Spain, 2014), but still not applied in practice (García Tenorio, 2016).

The following table resumes the key ideas stated in the video (Fertiberia, 2015), and the allegations related from the protesting collectives (Mesa de la Ria, 2015 & Greenpeace-Spain, 2016):

Statements Fertiberia	Allegations Social/Ecologic Collectives
✓ Existence of similar deposits all around the world	✗ They are not developed in areas with high ecologic value
✓ Restoration of 720 hectares	✗ The contaminated area embraces 1.200 hectares
✓ Two possible solutions: Deposit or Cloister: Only viable proposition	✗ Seems more coherent to leave to the Ministry of Environment, the regional government and the Country Members the responsibility of the proposal and no an enterprise condemned different times.
✓ “Significant Investment”	✗ The plan only benefits Fertiberia that will save millions of euros with a plan that doesn’t seem to be a real de-contamination one
✓ Guarantee of effective encapsulation and cloister of the toxic waste	✗ After more than 40 years polluting and viewing the evidences of filtering and leach in the other ‘restored’ zones...Guarantee?
✓ Phosphogypsum does not provoke any danger to the population	✗ Phosphogypsum contains radioactive isotopes such as depleted uranium, instable element that can divided into other radioactive elements
✓ Cloister works will last for 10 years and the monitoring and control 30 years	✗ Some of the waste components have physical periods of disintegration up to 4.500 million of years (uranium)
✓ Drainage of the toxic water and Waterproofing of the solid waste	✗ The waterproofing has to be done during the deposit to avoid groundwater contamination
✓ Guarantee of recovery, regeneration and integration of the area with the rest of the marshlands	✗ Past experiences with the other affected zones that are lost
✓ New uses after restoration regarding renewable energies	✗ Regional legislation state the uses of green belts and protected areas in cases of this environment

Table 24. Strengths and Weaknesses of the las project of redevelopment

In consequence, is not possible to identify the subsequent indicators (costs and funding) related with the last project of redevelopment, in a case where the transparency regarding the last project of redevelopment as well as the majority of the initiatives achieved during the progressive contamination of the Tinto Marshlands and its restoration seems to not be very clear. But, even if the proposal and approval of a project of restoration in the Tinto Marshlands (Zone 2 and 3) can be seen as a partial success, according to the key ideas of the project of redevelopment published by the enterprise and the response from the different social and ecologic platforms, it seems that the solution proposed doesn't fulfill all the implementations that the affected area needs after decades of environmental pollution.

SELECTED FACTOR	CHOSEN INDICATORS	NATURE	CONTENT
• Last Project of Redevelopment	✓ Costs	Quantitative*	✓ Remembering the costs of recovery of the Zone 1 (' <i>El Pinar</i> ' Marshlands) in 1995, with a cost of almost 11 million euros for a covering of the affected area, Zone 2 & 3 embrace approximately a similar surface with the need to achieve different steps apart of the subsequent cloister and covering of the toxic waste, consequently, the costs might be multiplied nowadays.
	✓ Funding	Quantitative*	✓ The responsible company, based on the contamination experiences of the other zones, won't assume the costs, so the funding may be arrived partly from the Administration, added to other non- published agreements.

Table 25. Chosen indicators for the last project of redevelopment

**The nature of the indicators chosen "A priori" is Quantitative, but due to the lack of exact information to quantify the costs and funding of the last project of redevelopment, the effects and content can be at least understood as qualitative.*

B. Main agents implicated

As it happened in CS1, the current case presents a complex scenario of interaction between different stakeholders. They can be grouped as well in four categories: Research Centers, Administration, Private Enterprises and Social and Ecologist Collectives; **but it is evident the bigger scale and size of the brownfield compared with the previous one and the conflicts arisen from it based on the more quantity of research centers involved (not just local universities as it happened in Portmán), the different levels of the Administration (from local to European) that influenced or conditioned directly the actions and responses in the area, and finally, the social and ecologic groups that played a key role in the aim of environmental justice.**

Also it is necessary to underline again (see Contextual Study) that the economy of the city is based on the industrial activity and this fact creates a context of **polarization in the citizens of Huelva**, being those families supported by the salaries from the industrial activity, consequently prioritizing the industry than the protection of the environment while those other families, with no relation with the '*Chemical Pole*', might be against it and the subsequent contamination of the marshlands.

The following table is going to expose the main stakeholders implicated directly or indirectly in this long process of recovery of the affected area.

(The indicators, as well as it is shown in CS1 are the columns of nature and role of each of the agents implicated in the process of restoration and recovery of part of the Marshlands of Huelva).

Actors	Level	Group	Nature* (Indic.1)	Role** (Indicator 2)
• European Commission	Supra-national	Administration	Public	<ul style="list-style-type: none"> • Environmental assessment that has received allegations from the social/ecologic platforms of Huelva • Potential joint financier
• Ministry of Environment & Ministry of Public Works	National	Administration	Public	<ul style="list-style-type: none"> • Ministry of Works was the entity which gave the concession to Fertiberia permitting discharges in a protected area • Ministry of Environment has proved a lack of political will, benefiting the enterprise and approving its project
• Junta de Andalucía (Regional Government)	Regional	Administration	Public	<ul style="list-style-type: none"> • No political will, fraudulent activity in the affected area with the enterprise and the Ministry of Environment • Provides a more or less clear legislation regarding waste, that is not respected afterwards
• EGMASA (Enterprise of Environmental Management S.A.)	Regional	Public entity	Public	<ul style="list-style-type: none"> • Public enterprise created concurrently between Fertiberia and the regional government • Achieving the management of some of the affected zones, with a clear lack of control
• Town Hall of Huelva	Local	Administration	Public	<ul style="list-style-type: none"> • Ambiguous attitude, between the chemical industry and the pollution of the environment • It has a clear urban planning in the local regulations, but permanently ignored by Fertiberia
• Fertiberia	Multinational	Private Enterprise	Private	<ul style="list-style-type: none"> • Spanish multinational specialized in fertilizers, with different plants in the region of Andalucía • Direct responsible for the contamination of the Huelva's estuary with toxic waste, dismissing an appropriate cleaning up
• Universities of Huelva & Sevilla	Regional	Research Centers	Public	<ul style="list-style-type: none"> • Have developed studies related with the contamination of the habitats, water, soil of the affected area • Labor of dissemination of technical details of the brownfield
• CSN & CSIC (1)	National	Research Centers	Public	<ul style="list-style-type: none"> • Both are respected and reference scientific entities, that have published technical reports regarding the deposits of toxic waste • Ambiguous attitude, being a no political entity
• Ecologist NGOs (2)	National	Collectives	NGOs	<ul style="list-style-type: none"> • Active participation, information and dissemination of the environmental threatening occurred in Huelva • Key in the long process of blockage of the discharges of toxic waste and against the approved project of restoration
• Social Platforms (Mesa de La Ría)	Local	Collectives	Legal entity	<ul style="list-style-type: none"> • Active participation in the protests, information, dissemination and expansion of the case in the media • Entity that has published a detailed list of allegations against the restoration project of the phosphogypsum deposits

(1) CSN: Nuclear Security Council & CSIC: Higher Council of Scientific Research / (2) Ecologist NGOs: Ecologists in Action, Greenpeace-Spain, WWF-Spain

Table 26. Chosen Indicators for the main agents implicated

SELECTED FACTOR	CHOSEN INDICATOR	DRIVER?	REASON	BARRIER?	REASON
<ul style="list-style-type: none"> Physical Appearance 	<ul style="list-style-type: none"> Surface Polluted Volume Pollutants Period of Contamination Nature of the pollutants 	<ul style="list-style-type: none"> No No No No 		<ul style="list-style-type: none"> Yes Yes Yes Yes 	<ul style="list-style-type: none"> Three marshlands have been polluted (1.200 ha) The total amount of pollutant have been 120 million tons There has been discharges during more than 40 years, polluting even after the expiration of the concession The toxic and radioactive nature of the pollutants make difficult to state an appropriate environmental restoration when until now the solution has been to cloister them away
<ul style="list-style-type: none"> Land Use 	<ul style="list-style-type: none"> Current Use of the Land 	<ul style="list-style-type: none"> No 		<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> The contaminated area are marshlands under regimes of environmental protection due to their high environmental values
<ul style="list-style-type: none"> Land Tenure 	<ul style="list-style-type: none"> Owner of the affected area 	<ul style="list-style-type: none"> No 		<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> The marshlands of Huelva are declared as a terrestrial-maritime public domain used fraudulently as deposits of toxic waste
<ul style="list-style-type: none"> Legislation in force 	<ul style="list-style-type: none"> Under which legislation is depending the recovery 	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> There is a more or less clear legislation in Andalucía regarding soil uses, waste management and protection of the environment 	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> The sub-product phosphogypsum is declared by the legislation in force as a non-dangerous waste despite the evident radiations. The legislation has been ignored several times
<ul style="list-style-type: none"> Cultural Heritage 	<ul style="list-style-type: none"> Inventory of elements Initiatives 	<ul style="list-style-type: none"> No No 	<ul style="list-style-type: none"> The evidences of mining activity are located far away the brownfield, so no direct influence in the recovery The local cultural heritage (Columbus Places) have been promoted but no real effects on the potential remediation of the polluted area 	<ul style="list-style-type: none"> No No 	
<ul style="list-style-type: none"> Natural Heritage 	<ul style="list-style-type: none"> Existence of Protected Areas 	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> It should state a solution where the original and restricted use of the marshlands would be effective 	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> The numerous protected areas have not being respected at all, being some of them even a restricted area do to their contamination of toxic waste

Table 26. Identification of Drivers and Barriers Phase (i)

Phase (iii): Execution of the new uses (Drivers and Barriers)

- Identification of Drivers and Barriers from Phase (i): Initial Characterization of the Brownfield

SELECTED FACTOR	CHOSEN INDICATOR	DRIVER?	REASON	BARRIER?	REASON?
<ul style="list-style-type: none"> • Last Project of Redevelopment 	<ul style="list-style-type: none"> • Costs • Funding 	<ul style="list-style-type: none"> • No • No 		<ul style="list-style-type: none"> • Yes • Yes 	<ul style="list-style-type: none"> • There have not been published by the enterprise, just mentioning “A significant Investment” understanding that the lack of transparency in these issues are not something positive • In other marshlands ‘restored’ by the enterprise, the funding has come from the public purse. The information published regarding the last problem doesn’t mention the funding at all
<ul style="list-style-type: none"> • Main agents implicated 	<ul style="list-style-type: none"> • Nature • Role 	<ul style="list-style-type: none"> • No • Yes 	<ul style="list-style-type: none"> • The social and ecologic platforms have been crucial for the blockage of the discharges and the statement of a project or remediation • The local universities have added several studies that support the arguments of these platforms • The enterprise has received the approval of the Ministry of Environment and aims to apply it soon 	<ul style="list-style-type: none"> • Yes • Yes 	<ul style="list-style-type: none"> • Again, the responsible private enterprise for the discharges has conditioned the potential recovery of the brownfield • General, dangerous and evident lack of political will from the three levels of the Administration • European Commission can pressure for a specific intervention • The enterprise states that its solution for the restoration of Z2 & Z3 is the only one viable • Local platforms protesting against the last solution for Z2 & Z3 as something that doesn’t solve the problem

Table 26. Identification of Drivers and Barriers Phase (ii)

➤ Identification of Drivers and Barriers from Phase (ii): Planning of New Uses

4.1.3 The Nalón Valley (CS3)

The Nalón River and its surroundings have been deeply affected by the high density of coal mining industries, having damaged and conditioned the whole valley aesthetically and in terms of environmental quality. With the implication of the Administration at regional and local level, and financial support of the European Commission there has been developed a whole project of redevelopment that has supposed an important success.

Phase (0): Contextual Study

E. Location and Justification

The Nalón River is located on the north of Spain, in the region of Asturias, being this stream the most important river of the region. It is born in the mountain range so-called 'Cantabric Mountains' and ending in the Bay of Biscay, crossing the whole region from south to north.

All along the first third of the river until the industrial city of Langreo, located in the outskirts of the capital of the region, Oviedo, the stream has been enveloped by an intense amount of industrial activities, specialized in traditional sectors (metallurgy and coal mining) that currently wouldn't have any viability and with strong impacts into the environment and the landscape (Fernández García, 1996), so-called to the area 'Las Cuencas Mineras' ('The Mining Basins').

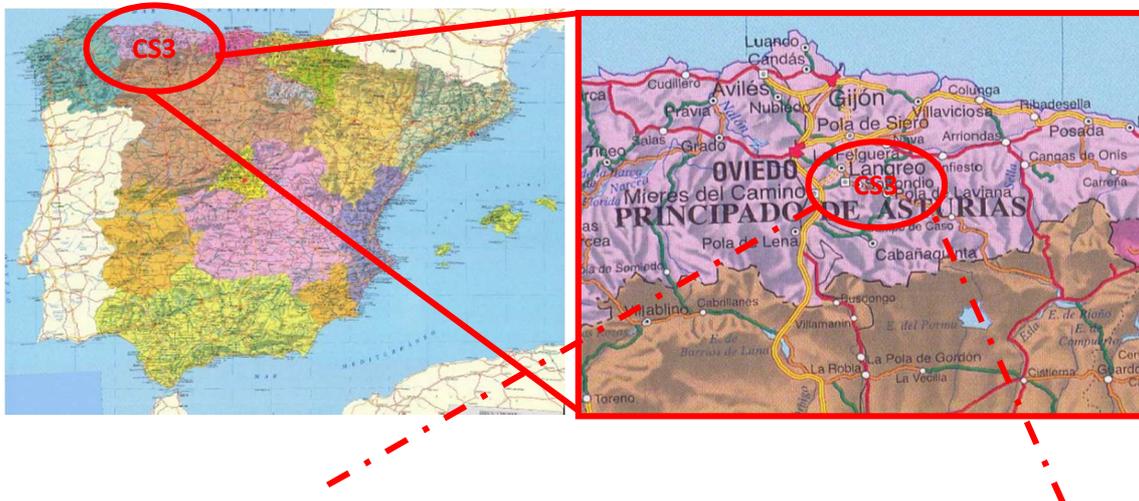
Consequently, in this case study there is not going to be identified a specific deposit or defined area that has been polluted or damaged with its subsequent process of deterioration, due to the reason that it was the river the place where the discharges from the threatening sites were being effective. In short, **in this Case Study, is the Nalón River itself the element that is considered as a brownfield, being the result a permanent environmental threatening.** Being the brownfields of the CS1 & CS2 clearly defined, the extension of the current brownfield, the Nalón River, is a scenario where numerous activities and infrastructures related mainly with the coal mining where discharging, depositing and threatening the material throughout small and spreading out mining concessions in both sides of the valley, with their own singular and local contexts of orography, geologic characteristics and social issues, but with a common basis of conditions, use of material, purpose and characteristics, that make appropriate **the choice of small representatives samples that can be comparable to the rest of small existing scenarios** that characterize the valley.

Different enterprises have been developing extracting and industrial activities in the area, and between them, HUNOSA ('Hulleras Del Norte S.A,' 'Northern Coalmines Company'), a state company created in 1967 to manage the main coalmines concessions (Suárez Antuña, 2005) all along the valley under concern. The chosen samples for the development of this Case Study were under the control of this enterprise and belonging to the municipality of Langreo. Being the activities and infrastructures of the valley divided mainly in three categories depending on their role in the mining process, the highlighted elements are going to be an **sample of a mining well, another one of a threatening site and finally a waste deposit, with their subsequent shift in relation with their uses, appearance and purpose.**

The last Case Study is located in the hotspots mentioned by the supra-national brownfield entities and networks (CABERNET, 2003), being Asturias one of the most important industrial centers of the country, and in consequence behaved under the 'tutelage' of the European Union as a result of their partial funding for a whole territorial and integrating project of environmental and industrial-cultural heritage that has stated a unique and pioneer case in Spain of successful brownfield redevelopment based on integrating regional strategies.

The following pictures, like the previous case studies, come from the national geographic viewer SIGPAC. In these images, the Nalón River itself is the brownfield under study, but as it is mentioned above, the zoom and focus is going to be on three representative samples located in the municipality of Langreo (capital of the Mining Basins), that show effectively the successful results applied in the area.

- Sample 1 (S1): 'San Luis Well', Samuño Valley, Langreo
- Sample 2 (S2): 'Modesta Threating Site', Sama, Langreo
- Sample 3 (S3): 'La Nueva Dump', Samuño Valley, Langreo



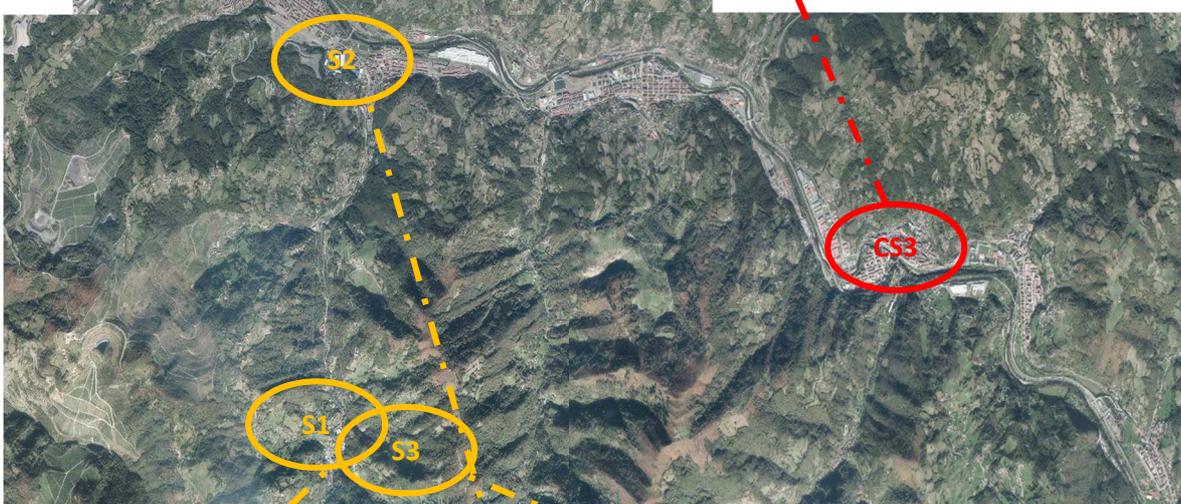
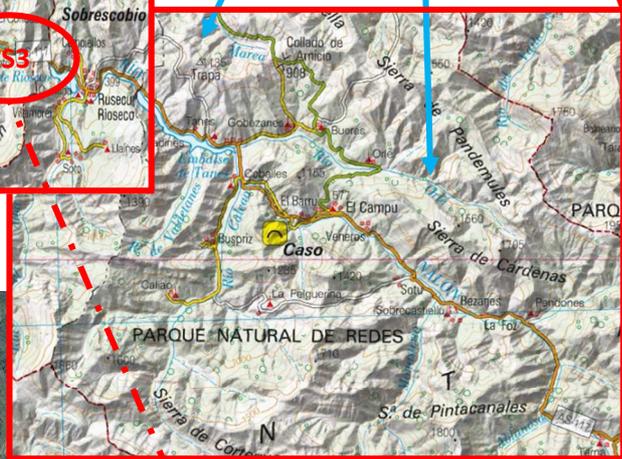
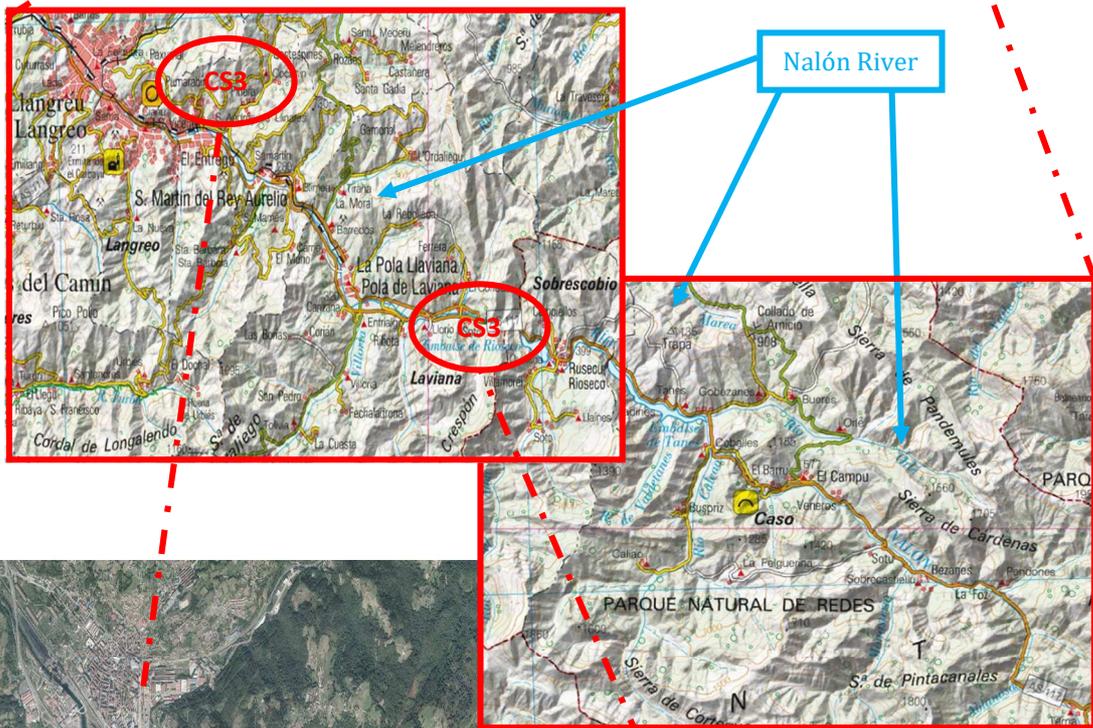


Figure 56. Zoom to the three selected representative samples. Source: SIGPac Viewer

F. Case Study background

- Since first half of the 18th century, Asturias started to use the different and abundant natural resources to substitute the use of the wood in diverse industrial processes controlled by the State, mainly weapons factories, with a two-folded purpose: the modernization of the manufacturing and the incentives for a potential industrialization of the country (Suárez Antuña, 2005).
- Through international investment, is born in 1833 the Mining Royal Company of Asturias (RCAM), with a whole process of characterization of the terrain, geologic studies, etc., starting an exploitation in which the benefits of the superficial deposits don't affect the future development of the deep ones, with already a negative and precarious conditions for the miners (Suárez Antuña, 2005).
- In 1852 started the service of a coal railway from Langreo to Gijón (the most important harbor of the region), stating the definitive incentive for a **large scale mining activity** all along the Nalón River, having the rest of the valleys problems related with communications (Suárez Antuña, 2005). The subsequent transformation caused by the intense industrialization in the center of the region had also landscape consequences affecting a territory that was mainly rural, affecting the functionality of the small rural clusters shifting from an economic activity based on agriculture and cattle raising to one dependent on the industrial incomes (Suárez Antuña, 2005). The companies chose locations nearby the different productive infrastructures, creating a huge contrast with already existing rural clusters (Suárez Antuña, 2005).
- Different developed techniques after the superficial mining were achieved such as the '*Mountain Mining*', with a more organized and planned extraction of the coal, initiating the construction of the first big extraction and transport mining infrastructures (railways, threatening sites, etc.); and also the '*Mining through Vertical Well*' starting a huge change in the mining landscape, with the use of the mineral layers contained under the level of the bottom of the valley through vertical extraction wells. The technique of exploitation through horizontal galleries following the coal layers is kept from the previous technique but adding the new element that condenses the center of all the activities: the well (Suárez Antuña, 2005).
- In 1909, there were in Asturias 3.160 mining concessions, mainly in the Mining Basins (Maurín Álvarez, 1987), lasting the intensity of the industrial activities until the second

half of the 20th century.

- The classification of the mining spaces seems to arise a basis of common elements with similar characteristics (the mix of residential and industrial land uses for example), but in practice each enterprise that acted in the Mining Basins had plenty of differences among them. These differences arise from the inequality of intensity of the activity in the region, bigger in the meadows of the main rivers of the basin and the enterprise regulations regarding the organization of the production space and execute the control of the surrounding territory (Suárez Antuña, 2005). So based on their location and the different enterprise regulations in the management of the production and residential areas they can be stated for models of mining spaces (Suárez Antuña, 2005):
 - Central Valley Mining Space
 - Central Mining Space from a secondary valley
 - Peripheral Mining Space
 - Ultra-Peripheral or Exterior Mining Space
- Before the constitution of the enterprise HUNOSA in 1967, obtaining the actions of 18 private coalmine companies with a context of crisis and shrinkage (Fernández Valcarce, 1992) it was possible to see the diversification of activities all along the valley as well as the existence of the mining spaces as products of the industrial revolution, acting the enterprises as engines of the urban development indirectly and leaving the urbanism itself for the Administration (Suárez Antuña, 2005). **Until 1983, the enterprise received the municipal license**, eviting until that moment the polluter's liability and the obligation of the environmental restoration (Fernández García, 1996).
- Consequently, due to the intense activity the level of contamination of the river was very aesthetically evident in the river and among the different mining demarcations. Fernández Díaz (2016), local inhabitant of the Nalón Valley declares "*I was born and raised near a black river (...)*" (pp. 2). **If the first threatening sites were getting back to the river the leftovers from the process of the cleaning of the mineral with coal dust, afterwards they were adding substances more and more aggressive with the environment** (Fernández Díaz, 2016). In fact, a local head of an enterprise recognize **that they were discharging 300.000 tons of ashes per year** (Fernández Díaz, 2016), testimony that shows the unbelievable scale of pollution if all the discharges from all the enterprises during all the years of industrial activities would be accessible. In 1984 the Central Government of Spain declared Langreo as Zone of Atmosphere Contamination due to the quantity of ashes pending in the air with a total volume 7.210 tons in 1980,

reduced in 1985 to 1.407 tons (Fernández García, 1996).

- The urban cluster Langreo was (and continues nowadays) being the center the Nalón Valley, kept its industrial specialization for more than a century. Adding the environmental and landscape damage, from 1965 it began the economic unfeasibility of the traditional productive sectors, losing in 20 years 100% of its metallurgy production (and 5.000 jobs) more than a half of the mining one (similar quantity of jobs) and $\frac{3}{4}$ of the rest of industrial activities. The social shrinkage was not that extreme, shifting from 71.000 inhabitants in 1965 to 53.000 in 1986 (Fernández García, 1996). To deal with the increasing shrinkage of the area, the local Administration, with a true dynamic aim, negotiated with the state industrial enterprises like HUNOSA (mining) and ENSIDESA (metallurgy) a mutual collaboration in the mutual transfer of soil, materials and infrastructures through different strategic projects of development and shift in the uses (Fernández García, 1996).
- In addition, in 1985, the regional government assumed as well the responsibility of the environmental restoration of the Mining Basins with the statement of the *'Integrating Plan of the Mining Basins'*, with an additional funding coming from the European Union since 1987 and approving the *'National Program of Community Interest'* (PNIC), being the execution from the Ministry of Public Works, Transport and Environment and the management and achievement of the works by the Northern Hydrographic Confederation. The majority of the work has been already achieved (Fernández García, 1996) with the quality of the water recovered by the end of the 20th century (Fernández García, 2016).

It is important to insist to the fact that the choice of representative samples of the scenario respect the existing precepts of diversity mentioned in this contextual study, belonging to the same company (HUNOSA) and belonging as well in the central area of mining activity (the municipality of Langreo), fact that adds more validity to this choice, strengthening in the common basis, in accordance with the exposition of Suárez Antuña (2005).

The following Figure is divided in (up to down and left to right): Image 57.1 Map of the old mining demarcations belonging to one of the old Mining Societies; 57.2 Mining workers from 'San Luis Well', Source: Archivo Histórico Minero; (Source from now: Maurín Álvarez, 1987) 57.3, Schema of a mining vertical well; 57.4, evolution of the population along the Nalón basin between 1887 and 1981; 57.5 map of the mining environments in Asturias.

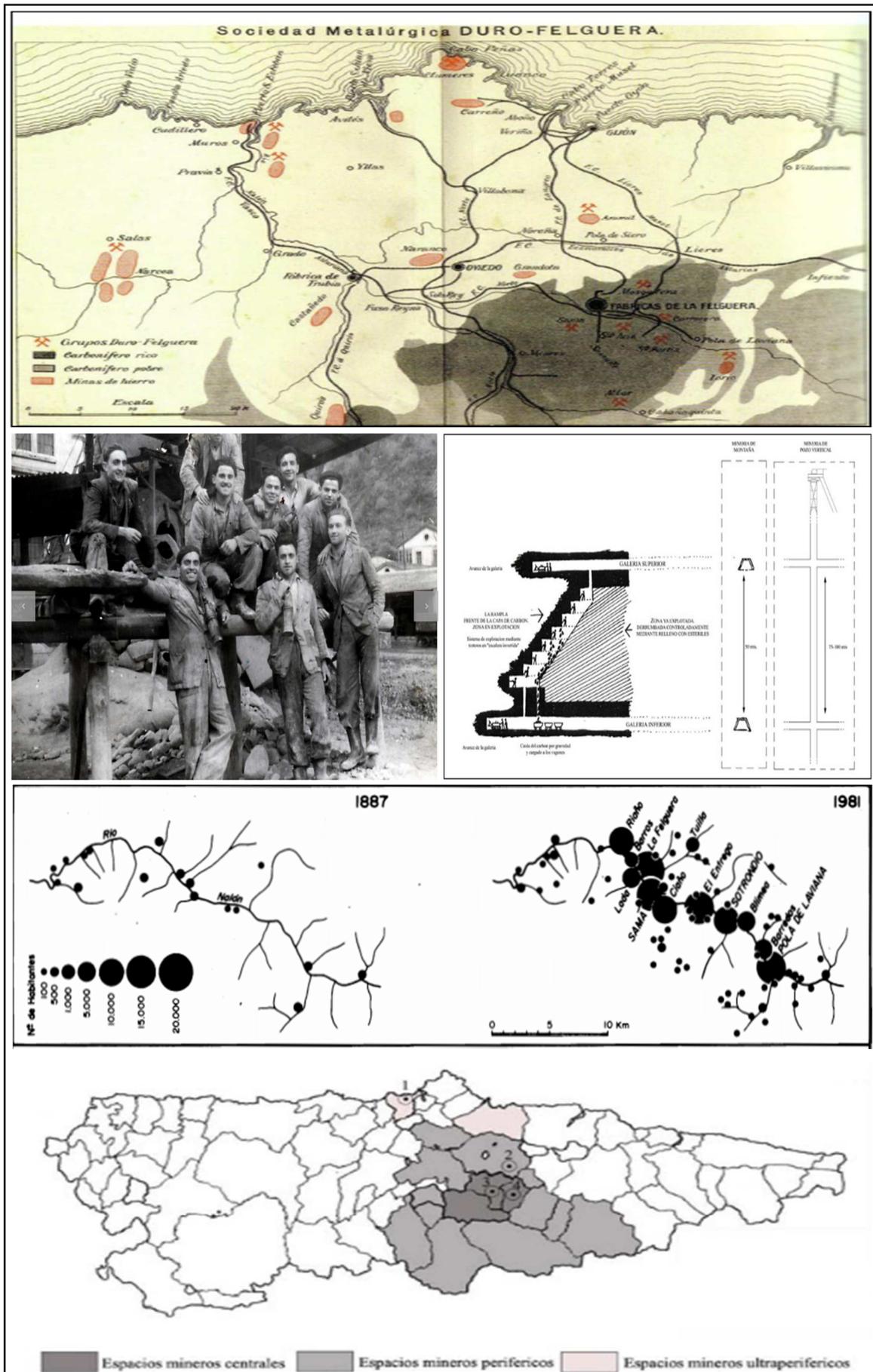


Figure 57.

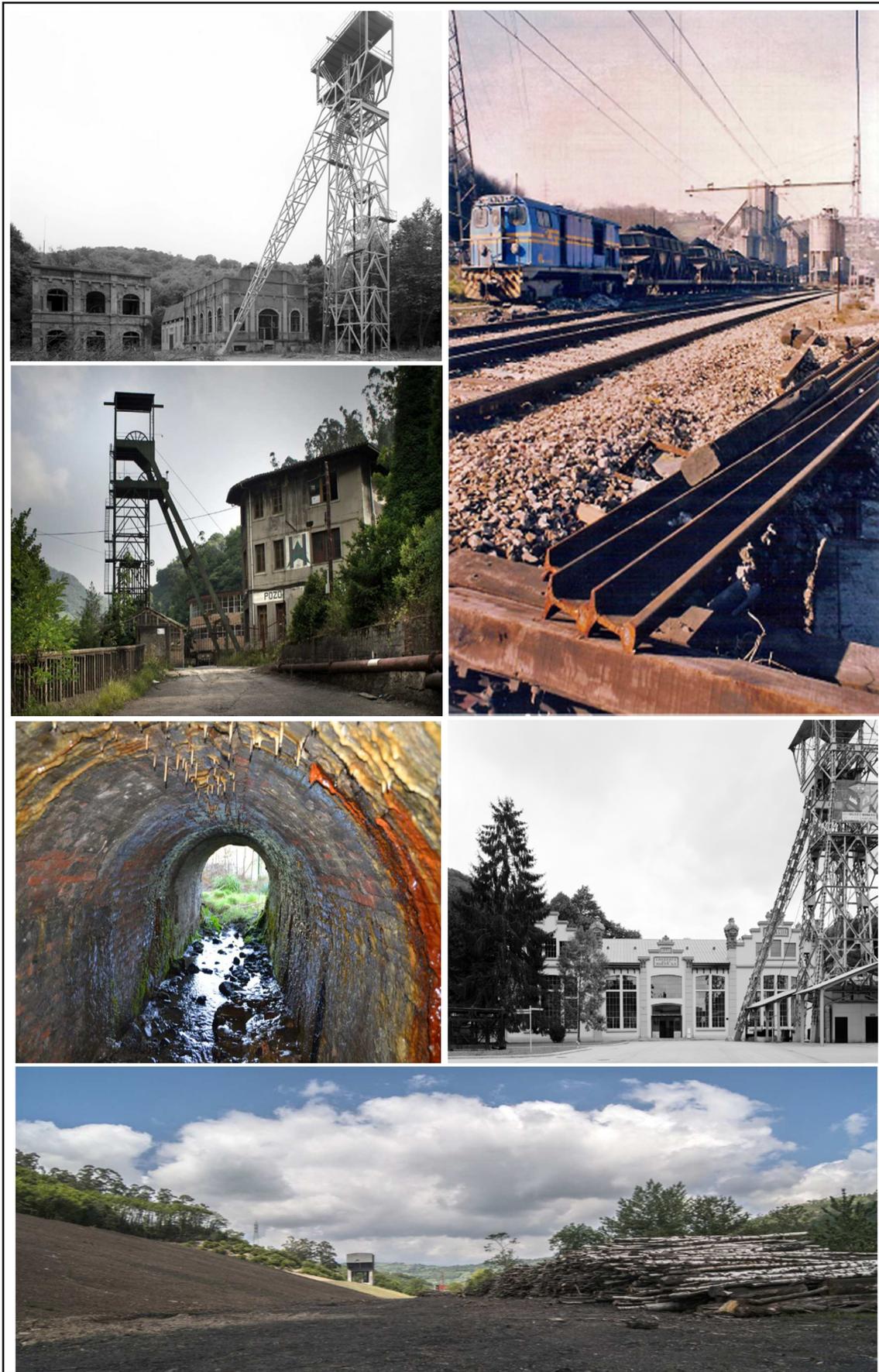


Figure 58. Examples of Mining Concessions, Mining railway, mining entrance and mining deposit around the Nalón Valley. Source: Archivo Histórico Minero

Phase (i): Initial characterization of the brownfield (Current Status)

B. Physical appearance

Again, the geographic information services and platforms provided in this region added to the national one might help to identify the physical characteristics of the area. First, from the Digital Photographic Library of the National Geographic Institute, is going to be shown the section of the Nalón River surrounding Langreo and the three representative samples of the brownfield listed before. This zoom into a specific area to distinct the physical appearance of the brownfield is due to the wideness of the scenario where the brownfield (the river) goes through, added to the fact that this area has been characterized with probably the most important urban cluster belonging to the Mining Basins.

These figures will display aerial images from 1945 until 2014 (See Figures 59, 60, 61 and 62). As well as it happened in CS2, some of the figures are composed by the merging of 2 or more aerial images taking into account their overlapping. The three samples have been highlighted for a better identification in those historical images. Moreover the latest image from the PNOA program is going to zoom into those three representative samples for the correct identification of their current physical appearance (Figures 59, 61 & 62), adding past images before start the process of redevelopment.

Another detail that might need to be highlighted, is the issue related with the Inter-Ministry Flight achieved between 1973 and 1986, **covering the whole country with aerial images instead the whole area of Asturias belonging to the Mining Basins** (See Figures 60.1 & 60.2) during probably the previous period before the decline and the economic viability of the industrial activity in the area. Knowing the existence and presence of State Mining Enterprises depending on the Central Government plus the evidences of contamination through the water and the air (See Background Study), it may be strange that the only frame of the country not covered by the plane is an area where probably the aerial evidences of contamination would provoke different reactions against. In addition, is the **same situation that occurred with CS1**, when during the period of highest mining production there was no official information related to the aerial images of the Bay of Portmán (See CS1).

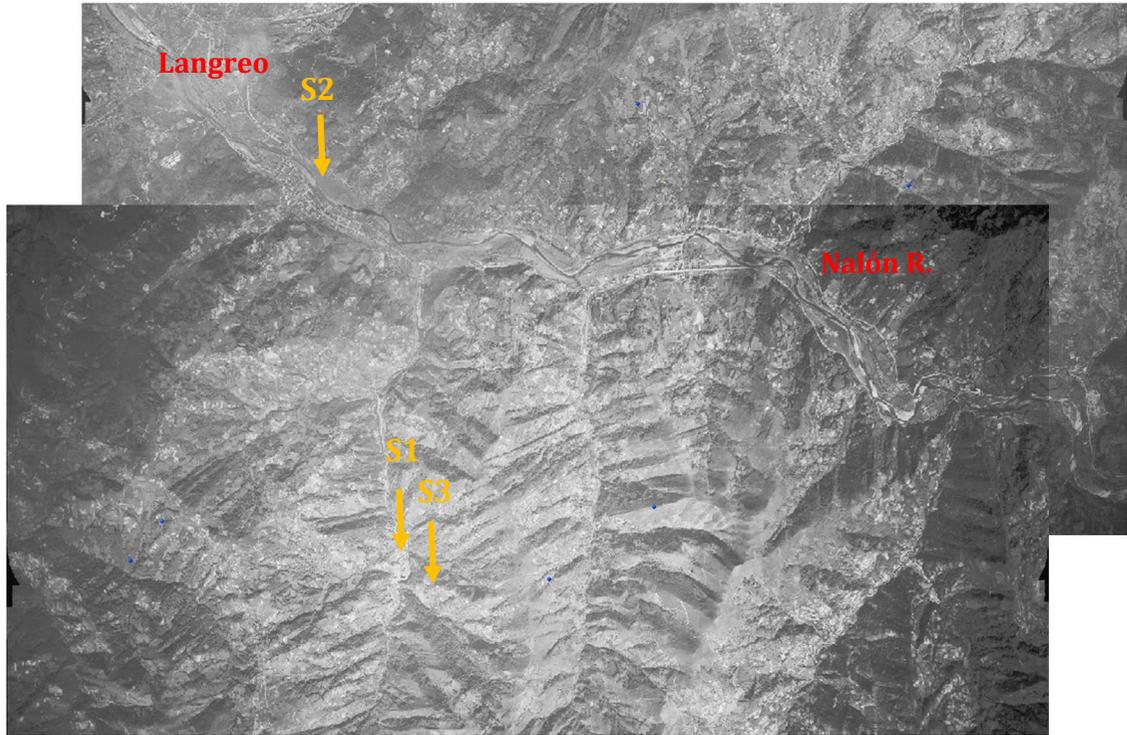
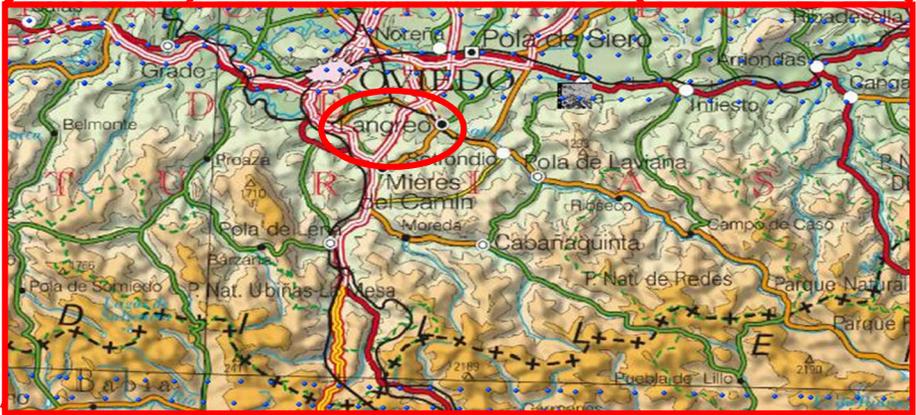
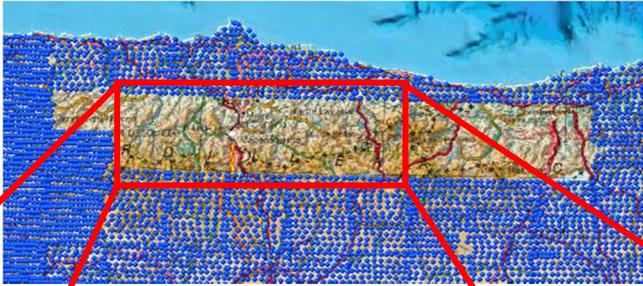
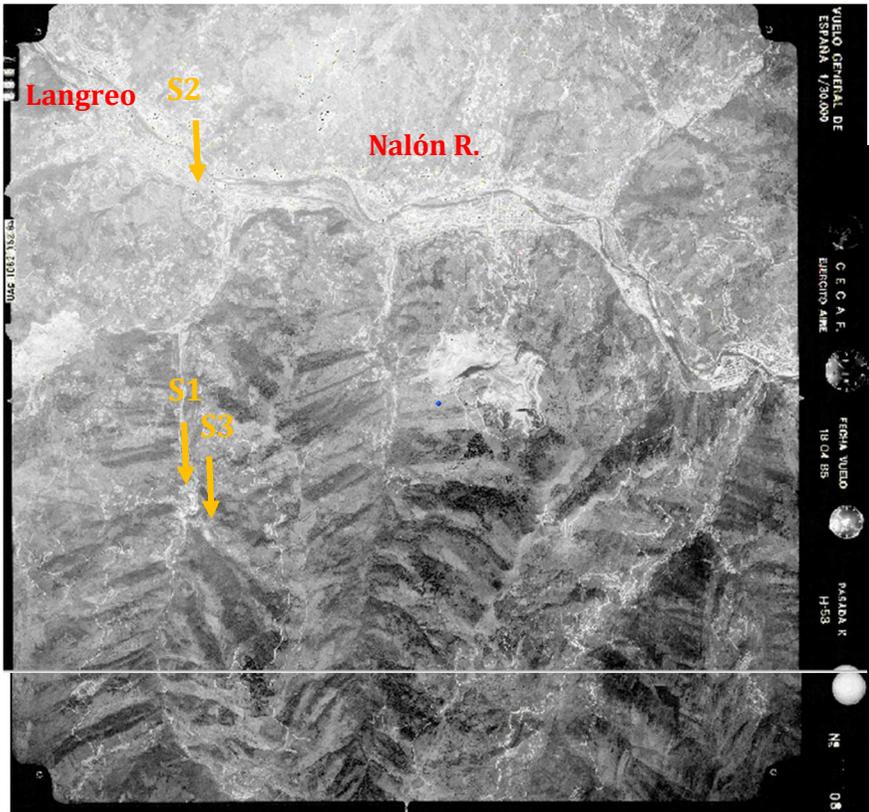


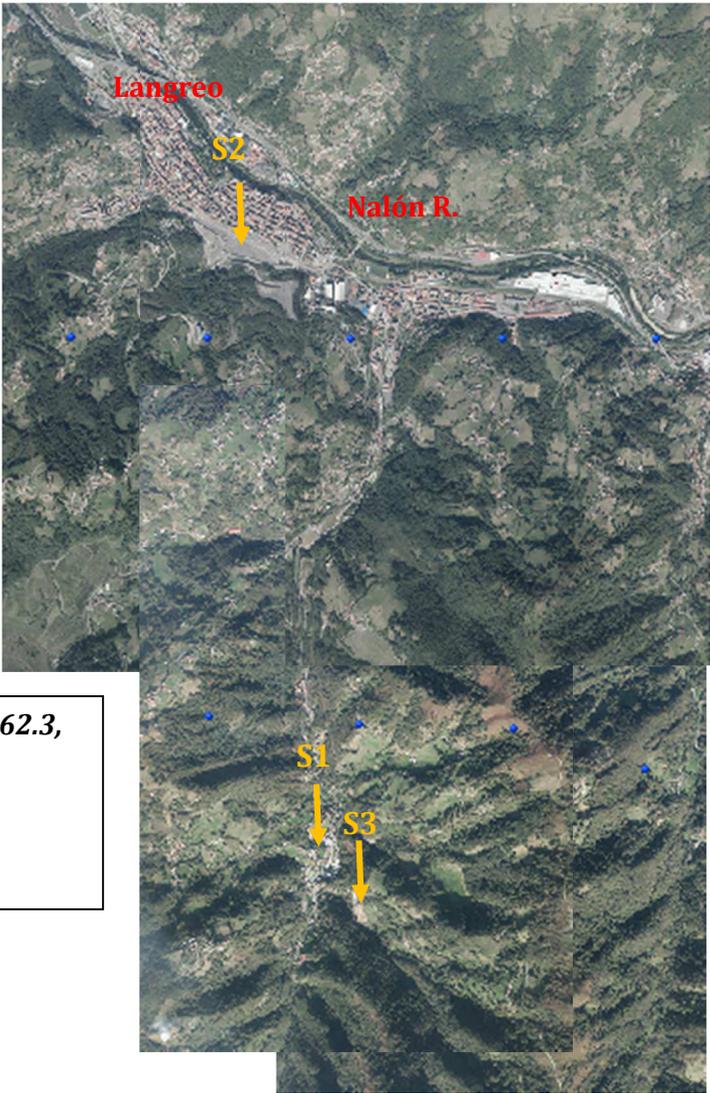
Figure 59.1 & 59.2
American Flight - A series
(1945-1946)

Figure 60.1 & 60.2
Inter-Ministry Flight
(1973-1986)
Area missing*



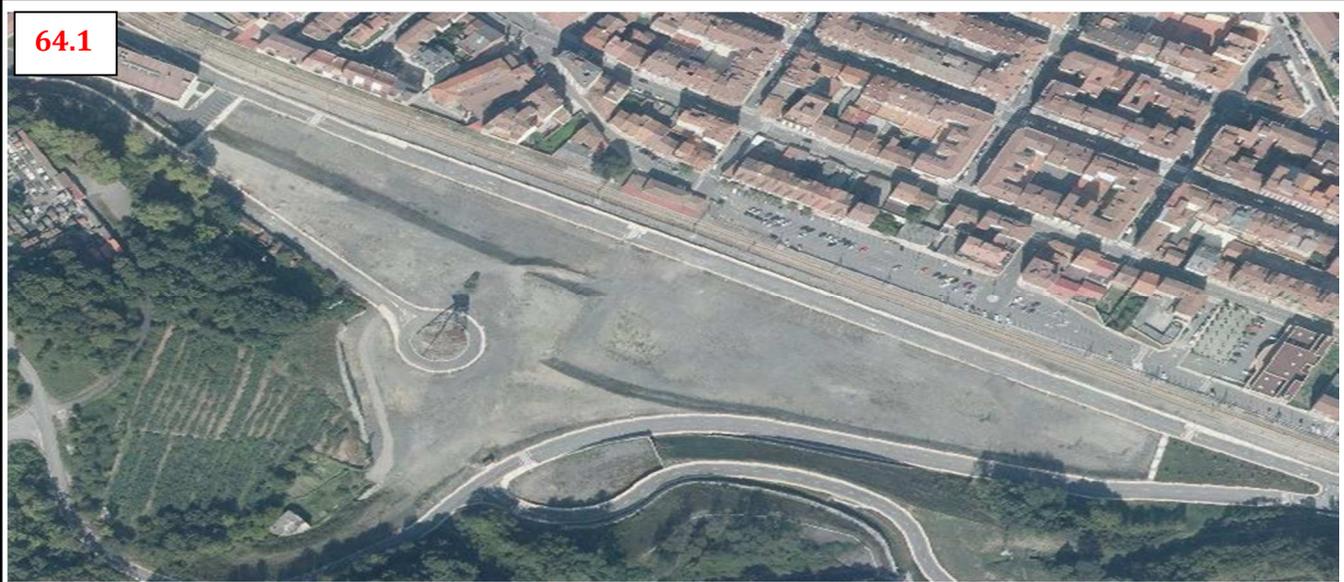


*Figure 61.1 & 61.2
National Flight
(1980-1986)*



*Figure 62.1, 62.2, 62.3,
62.4 & 62.5)
PNOA Flight*





64.1



64.2



64.3



64.4



64.5

The appearance of the three samples show the process of recovery or transition achieved (case of S1) or on going (S2 & S3) as example of the emphasis and put in value of the mining heritage and the environmental and landscape restoration. The three delimited scenarios show different complexes of mining infrastructures with different uses while the coalmining was going on, different current conditions and finally different purposes and uses for redevelopment.

- **S1, 'San Luis Well'**, located in the area so-called 'La Nueva' was before one of those Central Mining Centers mentioned by Suárez Antuña (Quote 2005) in the background study of a secondary valley (Samuño Valley). Nowadays the well is closed and since 2013, the rest of the surrounding mining infrastructures **have been changed into an Eco-Mining Museum** (Eco-Mining Museum of Samuño's Valley) with the restoration and exposition of the different elements, scenarios, machines and buildings that were functioning not long time ago for the extraction of coal. This restoration was effective as a result of the restoration plan promoted at every level of the Administration (See **Phase (ii)**). The sample includes: Mining railway station **(1)**, railway **(2)**, San Luis Well **(3)**, Machine's House **(4)**, well's tower **(5)**, among other elements such as offices, toilets, repair building, infirmary, carpenter's shop and forge (Eco-Mining Museum of Samuño's Valley). The images showed above show how the area looked like at the beginning of the 20th century (Figure 63.2), while there were being restored (Figure 63.3) and the results that are evident nowadays (Figures 63.1, 63.4, 63.5 & 63.6).
- **S2, 'Threatening Site of Modesta'**, was the main threatening site of the area (Hernández Muñíz, 2016), receiving the mineral upstream of the central and secondary valleys through the mining train (See Figure 64.3, for example the one coming from S1 'San Luis Well'). Through municipal plans of redevelopment and shift of the occupation of the soil (Fernández García, 1996) the whole infrastructure has been demolished (See Figure 64.4), presenting nowadays the physical appearance of Figure 64.1 and keeping just the mining tower (Figure 64.5) as the last evidence of mining activity in the parcel. It is planned the development of a new industrial complex, putting in value the soil and shifting into new productive industrial activities.

- **S3, 'La Nueva Deposit'**, has been one of those numerous deposits of waste from the extraction areas that surrounded all the coalmines and their wells along the Mining Basins. In this sample the deposit was the one used from 'San Luis Well' (S1). Shifted into a football pitch and vegetal covering, having restored the aesthetical impact of the deposit and stating new public uses (See Figures 65.3 & 65.4 below), being evident the improvement from previous situation with the abandoned deposit (Figures 65.1 & 65.2).



Regarding the characteristic indicators chosen for the physical appearance, again is necessary to insist on the fact this brownfield has a different scale than the two previous ones (with a more or less delimited brownfield in a specific clear area) and that the three mentioned samples are a representative part of the whole Nalón Valley and the Mining Basins. As a consequence, **the quantitative indicators, instead of an exact or approximate datum, as it happens in the other cases, there are going to be based on estimations from the available information that are going to arise an approximate perspective of the effect of these indicators.**

SELECTED FACTOR	CHOSEN INDICATORS	NATURE	CONTENT
<ul style="list-style-type: none"> Physical Appearance 	✓ Surface of Contamination	Quantitative*	✓ Being the river affected by each of the existing sources of contaminations, having the river a length of 141 kilometers (Cantabric Hydrologic Confederation) and understanding that the majority of the mining activities were developed in the first third of the river, it can be estimated that approximately 47 kilometers of the river suffered a direct contamination , affecting through the stream the rest of the river with the transport of the waste.
	✓ Volume of the pollutants	Quantitative*	✓ If one enterprise assumed the discharges of 300.000 tons of waste into the river; knowing that there were 18 private companies, assuming at least one demarcation per company, that would suppose an estimation of almost 5,5 million tons of waste per year
	✓ Period of Contamination	Quantitative*	✓ Understanding the action of contamination in a big scale, since the construction of the mining railway in 1852 and until the shrinkage of the coal industry in the 90s, more than one century .
	✓ Nature of the pollutants	Qualitative	✓ Mainly waste from the cleaning processes of the coal: coal dust and aggressive substances

Table 26. Chosen Indicators for the Physical Appearance

C. Land Use & Land Tenure

The Land Use and Land Tenure of the Mining Basins follow a common schema comparable among the different mining demarcations. First, continuing the retrospective approach of the other case studies, is going to be explained the traditional model of urbanization and use of the soil through the example of Langreo as the maximum exponent of the characteristic spatial planning of the area. Then the current use of the land of the three selected samples is going to be identified (slightly mentioned in previous sub-section) with the shifts into new land uses as a result of the application of the multi-scale plans of redevelopment and restoration, as representative examples of the different priorities and tendencies after the shrinkage of the mining industry.

First Land Use is reflected with a **combination between residential soil and its subsequent services and the industrial one plus its deposits of waste** (Maurín Álvarez, 1987). The clearest example would be the municipality of Langreo, center of the industrial activities, with a characteristic linear morphology of urbanism due to the physical characteristics and the orography of the area (Maurín Álvarez, 1987). The figure below shows a schema of the land use in Langreo through its different districts (Rioño, Barros, La Felguera, Lada, Sama and Ciaño), displaying this combination of residential and industrial on both sides of the Nalón River.

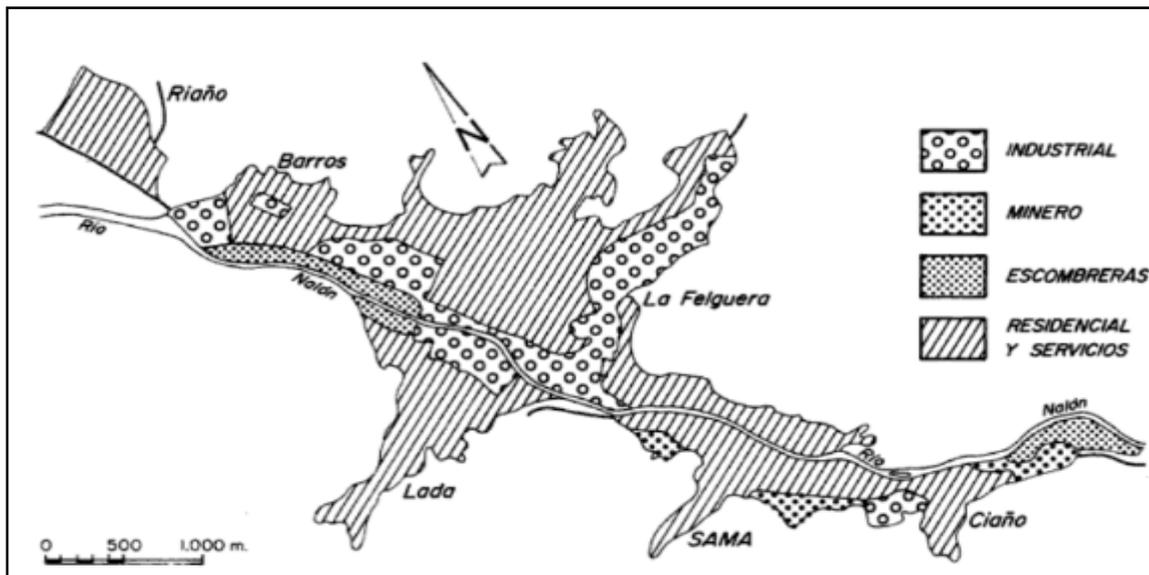


Figure 66. Old Land Use of Langreo. Source: Maurín Álvarez, 1987

According to Maurín Álvarez (Quote 1987) the establishment of the different ‘ordered’ physical units integrating the urban structure is based on a ‘*particular location logic*’. The mining-industrial infrastructures and their communications linked to them, are those what, according to ‘technical criteria’ of profitability and costs reduction, are prioritized and emphasized in the urban structure with the rest of the elements located in their surroundings (Maurín Álvarez, 1987). In summary it is conformed an ‘**inverted urban structure**’ where the center is dominated by the industrial uses and the peripheral areas would be for residential use (Maurín Álvarez, 1987).

This criteria might be transposed to the small mining clusters located in the secondary valleys, following a similar schema, where the mining-industrial building and infrastructures conditioned the morphology of the small settlements, giving a residual importance for the rest of facilities and constructions. This precept was the basis to reduce

the displacement time, when the ways of transport were very limited, locating the settlements of workers close to the mining production units in an environment of deficient conditions (Maurín Álvarez, 1987).

In relation with the land tenure, it seems that the mining enterprises were extracting and producing without a specific license, typical in large scale mining scenarios at that time. So basically, in each demarcation the enterprise was the only responsible for the processes involved, in a period where the legislation was not enough (Maurín Álvarez, 1987). A very good example is HUNOSA, the state enterprise that absorbed all the existing private ones while the existence of a framework of decrease of economic profitability for the mining production, got its municipal license in 1983 (eviting until that moment the legal requirements of the environmental restoration of the affected terrains) (Fernández García, 1996). With all the demarcations in control of HUNOSA, the definitive shrinkage of the mining production provoked the abandonment of the majority of the infrastructure, stating a continuous scenario where terrains, deposits and neglected constructions were shaping the landscape of the Mining Basins with different social, economic and environmental impacts (Gobierno Principado de Asturias, 2006). The answer of the enterprise to this progressive closure of the mining actives, under the logic of the proposed spatial planning by the regional government, through the put in value and the environmental restoration of those terrains released, acting as an instrument of channel of the mining funding coming from the European Union and offering the mentioned terrains for the different industrial initiatives stated from the regional government (Gobierno Principado de Asturias, 2006).

Focusing now with the current use of the three selected samples after the end of the large scale mining activity, show and prove this aim mentioned by the regional government of put in value all the terrains and parcels affected by the effects of the coalmining. In the next page there is going to be exposed through the information from the regional service of the SIOSE program with the current uses of the three samples:

- **S1:** The area of 'San Luis Well' has been completely restored, keeping the denomination of mining soil (see Figure 68.1), but through the put in value of the mining heritage with the creation of the Eco-Mining Museum from the remaining mining buildings and facilities mentioned in the previous factor. **In short leisure, culture and heritage tourism for an area that is completely restored.**



Figure 67

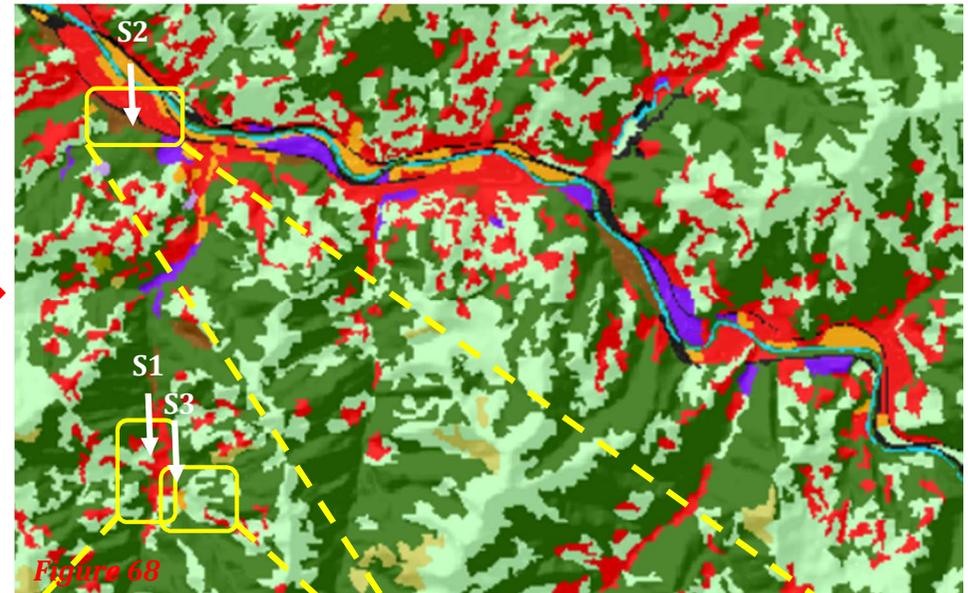


Figure 68



Figure 67.1



Figure 67.2



Figure 67.3

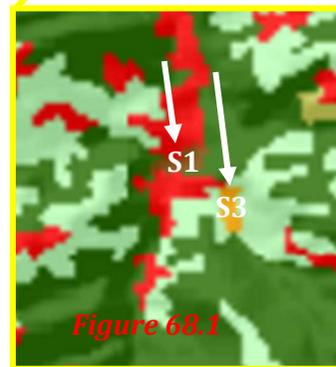


Figure 68.1



Figure 68.2

- | | | | |
|---|------------------------|---|----------------------------|
|  | • Residential |  | • Mining |
|  | • Industrial Sector |  | • Transport Infrastructure |
|  | • Services & Equipment |  | • Herbaceous Covering |
|  | • Scrub |  | • Wood Forest |

SIOSE Asturias

- **S2:** the parcel of the ‘threatening site of Modesta’, **has kept the industrial character of its soil** (See Figure 68.2), but removing the whole mining infrastructure and just keeping the mining tower as another example of the emphasis on the mining heritage. The use of the land is supposed to be oriented to new industrial uses, still to be confirmed.
- **S3:** finally, the terrain where before was located a coal deposit from the existing mines of the Samuño’s Valley has shifted in a two-folded purpose: part of the area is now stated for **the use of services and equipment for public use** (through the creation of a football pitch for the rural cluster where the Eco-Mining Museum is located), being the other part restored with a vegetal cover, to evite sliding and integrate them into the landscape (Fernández García, 1996), **achieving a complete environmental restoration of an old mining deposit.**

In summary **these three samples are very representative cases of the different transitions developed from abandoned and derelict mining industrial soils shifted into areas for public use, new industrial development and environmental restoration, what proves that through integrating projects of redevelopment and caring about the social and environmental dimensions are compatible with the industrial development.**

SELECTED FACTOR	CHOSEN INDICATORS	NATURE	CONTENT
• Land Use	✓ Current Use of the land	Qualitative	✓ The old mining areas have been transformed into new uses to strength into the social and environmental restoration, put in value of the mining heritage and development of new industrial uses.
• Land Tenure	✓ Owner of the affected area	Qualitative	✓ All the mining areas are legally under the control of HUNOSA but, the enterprise has acted as a driver of the initiatives of restoration and development stated by the Administration at all scales

Table 27. Chosen Indicators for the Land Use & Land Tenure

D. Current legislation in force

The success in the Case of the Nalón Valley and the Mining Basins is evident based on the results, **but most of this success came with the implication of all the Administrations at every level (local, regional, national and European) emitting appropriate regulations and legislative instruments in the same direction.** Since the point of departure of integrating plans of redevelopment in the mid-80's there have been several plans that have strengthened in this social, territorial, economic and environmental recovery and redevelopment. As a consequence the examples that are going to be highlighted are those legislative instruments stated and applied after the definitive shrinkage of the coal mining in the mid-80s. It is interesting how the first initiatives started with a dynamic town hall (Fernández García, 1996) and confirm the potential recovery with the external funding of the European Commission in 1987. In consequence the order is going to be bottom-up from local to supra-national level, highlighting the first pioneer legislative instrument that started the recovery of the Mining Basins and the Nalón River.

- *Local level:* Again, focusing on the municipality of Langreo as the center of the definitive shrinkage of the productive mining activities (Fernández García, 1996). Since its 'democratization' in 1979, the town-hall of Langreo, with a dynamic aim, proposed an **integrating plan, merging a three-folded purpose: economic promotion, urbanism and environment** (Fernández García, 1996). In short, industrial shift, transition and expansion through environmental restoration.

The first two purposes were understood as a 'synergy', developing on one hand a new General Plan of Urban Planning (1984) for an industrial transition into new industries and the clear separation between industrial and residential areas (See sub-section of Land Use & Land Tenure) and on the other hand, the local government obtained the compromise of the state enterprises HUNOSA and ENSIDESA (mining and metallurgy respectively) to collaborate (Fernández García, 1996). The environmental purpose was joint with the environmental recovery of the Nalón Basin, understanding that the future of the mining municipality will be depending on the river, as well as the future of the Mining Basins and finally the future of the region (crossing the river the whole circumscription until the Bay of Biscay) (Fernández García, 1996).

- *Regional Level:* the regional government took part critically in this process of recovery of the Nalón River and its basin, through the proposition in 1985 of the

'Integrating Plan of the Mining Basins' (Fernández García, 1996) and more instruments proposed since then to achieve the complete environmental restoration of the brownfield and surrounding natural spaces affected by the mining activity.

- *National Level:* the Ministry of Public Works, Transport and Environment was the responsible national entity for the execution of the Plan proposed by the European Commission (see next level), financing two thirds of the total budget (112.125 million Euros) for the sanitation of the river (Fernández García, 1996). With this initiative the Ministry has a double objective: recover a key industrial area of the country and use the Nalón River as an example of degraded, contaminated and affected river restored and recovered effectively (Fernández García, 1996).
- *Supra-national level:* in 1987 the European Community approved the 'National Plan of Community Interest of Asturias' where it was included an ambitious project of regeneration of the river with the subsequent additional funding (Fernández García, 1996).

As a recapitulation, **the success has an endogenous character, with the promotion and implementation starting at a local level but with effect and benefits with a clear regional one.** Then an active and implicated regional government, aware of the importance of the appropriate recovery of one of the most important industrial centers of the region that was going to crash without a clear shift-oriented integrated plan. And the critical external funding from the Ministry and the subsequent one from the EU.

The results can be checked through the selected representative samples (Land Use subsection) where it can be distinguished the permanent shift and transition aim, promoted by the local government, regarding environment, urbanism and industry, reflected into the new uses of S1, S2 and S3 respectively: Restoration of the mining infrastructures and put in value of the mining heritage, demolition of the old mining threatening site and aim of a new industrial complex and shift from mining deposit soil into equipment and leisure as well as vegetal cover to reduce visual impact. So each of the mining and rural cluster has been changed, restored or remove according to an integrating criteria, caring about the scenario as a whole and interpreting the necessary potential needs of the area with the key issues that conform the backbone of the Valley.

This case of Asturias, can be understood as pioneer in comparison with the other two cases already exposed in Murcia and Andalucía. The main reason might be the fact

that the four possible levels of the Administration were acting as Drivers for redevelopment, incorporating local and regional regulations as part of a whole integrating aim with a territorial perspective, respecting the endogenous character of the scenario but giving to it a territorial cohesion aim which positive effects would be reflected in the whole region. So the first regulations (those highlighted above) might acted as project of redevelopment by themselves.

The table below develops the identified indicator for this selected factor:

SELECTED FACTOR	CHOSEN INDICATORS	NATURE	CONTENT
• Legislation in force	✓ Link with the process of recovery	Qualitative	<ul style="list-style-type: none"> ✓ Endogenous reaction from the local government of Langreo, stating an ambitious and integrating project of industrial transition through environmental restoration and territorial cohesion ✓ Implication of the regional government for the recovery of a key productive area applying to EU funding ✓ Key co-funding from the EU and the Ministry of Transport and Environment

Table 28. Chosen Indicators for the Legislation in force

E. Elements of cultural and natural heritage

The scenario of the Nalón Valley, the Mining Basins and their surroundings are under different frameworks of protection for their heritage and environmental values. This general put in value of the mining heritage shows how important has been the mining activity in a large-scale scenario of extraction of production of coal and metals, but without dismissing at any point the importance of the new role of the mining infrastructures with their natural landscape and environment, merging both assets with integrating aim.

Regarding the cultural and mining heritage there has been a general put in value of the mining infrastructures after the decline of the mining activities, looking for new development alternatives through the maintenance, rehabilitation and the subsequent

assessment of the inherited mining and industrial heritage, are part of a valid strategy, stated to revitalize these territories, in the majority of the cases with actions linked with the tertiary sector and specially tourism (Cañizares Ruiz, 2011). Three representative examples of this reality are:

- ✓ The inclusion of the Mining Basins of Asturias in the UNESCO Tentative List in 2007 by the Ministry of Culture (UNESCO, 2007) as Mining Historical Heritage.
 - The Eco-Mining Museum, located in our **S1**, as the **maximum exponent of these initiatives that strength on the importance of the coalmining for the local identity**, with the restoration of the mining facilities, already mentioned in the subsection of the Physical Appearance.
 - The historical archive of HUNOSA, located in an old mining well complex (another example of heritage restoration) shows **the implication of the enterprise in the dissemination of the mining heritage**, with the most important collection of mining archives of Asturias with more than 100.000 of documental units (HUNOSA)

In relation with the natural heritage, the Nalón Valley has suffered the consequences of the aggressive activities and environmental threatening developed during mining period, with a direct impact on the local habitats, landscapes and environment. Nevertheless, the protection of the environment along the Nalón basin has been effective from regional and supra-national initiatives. In fact, the **area itself of the Mining Basins has been declared by the regional government as Protected Landscape** (Decreto 36/2002) mainly included in the central coal basin. In addition the area under concern embraces surrounding spaces that are under regimes of environmental protection. The figures below are extracts of maps published on the regional geoportal of Spatial Data Infrastructure (SITPA) displaying the existence and location of protected areas in the Nalón Valley and its surroundings, in accordance to the regimes of: Natura 2000, Figures 69.1 and 69.3 and the Protected Natural Spaces of Asturias (RRENPA) Figure 69.2.

The following table summarizes the identified indicators:

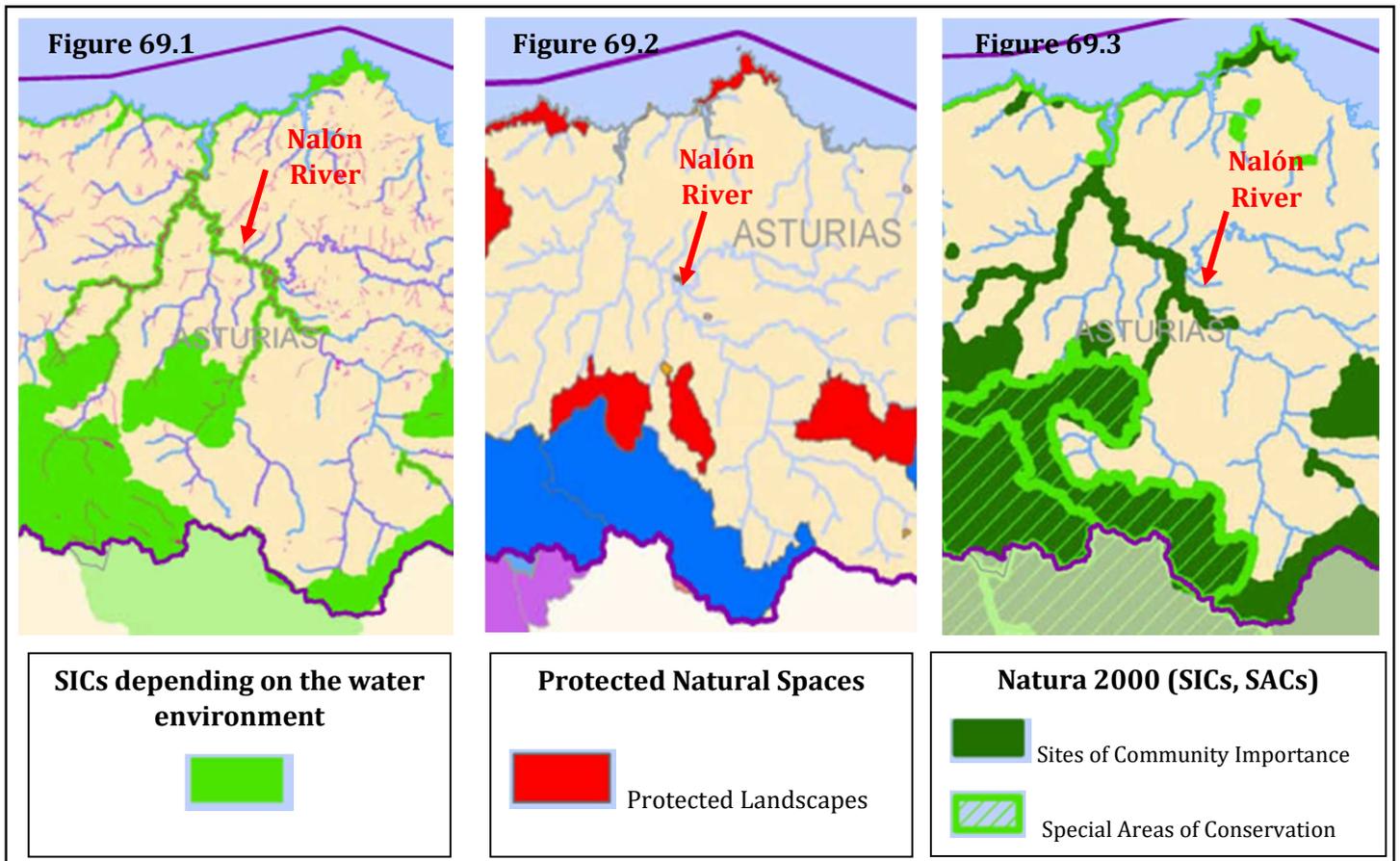


Figure 69. Details of the existing protected areas surrounding the Nalón Valley

SELECTED FACTOR	CHOSEN INDICATORS	NATURE	CONTENT
• Cultural Heritage	✓ Inventory of Elements	Qualitative	<ul style="list-style-type: none"> ✓ There is a huge inventory of the mining heritage, promoted from the regional government and even the enterprise that managed all the mining demarcations (HUNOSA). ✓ There are plenty of examples, almost all the mining demarcations have been restored cultural and environmentally
	✓ Initiatives	Qualitative	
• Natural Heritage	✓ Existence of protected areas	Qualitative	<ul style="list-style-type: none"> ✓ The mining area located all along the brownfield itself (first third) is protected as well as the existence of spaces under supra-national regimes of protection (Natura 2000)

Table 29. Chosen Indicators for the Cultural and Natural Heritage

Phase (ii): Planning of New Uses

C. The last project of redevelopment for the brownfield

As it was stated in the sub-section of the legislation in force (**Phase (i)**) linked with the process of recovery of the brownfield, it was found out the singularity that **the legislation in force, with an integrating aim and a multi-level of implication from the Administration, could be considered as the project of redevelopment itself**. By contrast the rest of the cases (CS1 and CS2) had the proposal, statement, acceptance or rejection of a specific site-scale project of redevelopment and recovery for a clearly delimited brownfield. Consequently, being already underlined those legislative instruments that start the process of recovery, it would be redundant for the reader to repeat them again due to the reasons from the paragraph above.

In addition, another factor that may influence the pragmatism and dynamism of the local government for the promotion of their restoration and redevelopment plans, was the level of local identity that probably exist among the local population, in an area that had a high level of unemployment before the creation of the large scale extraction and production of coal mining and industrial labor. Fernández Díaz (2016) **strengths on the self-esteem factor as general need to invest on**, obtaining as a result this very strong emphasis on the traditional use of the land and it's put in value in the chosen scenario, and throughout the representative samples S1, S2 & S3.

The chosen indicators for this factor (regarding those initial plans of redevelopment that initiated the recovery of the river) are the following (most of them identified already in the sub-section of the legislation in force) contained in the *Table 30*:

SELECTED FACTOR	CHOSEN INDICATORS	NATURE	CONTENT
<ul style="list-style-type: none"> • Last Project of Redevelopment 	✓ Costs	Quantitative*	✓ The estimation of the costs might not be possible to calculate, but assuming that two of three pillars that conform the aim of the redevelopment (environment and urbanistic restoration of the mining infrastructures) doesn't seem to have a huge quantity of direct benefits to cover the potential costs; by contrast, the potential industrial expansion would obtain more income.
	✓ Funding	Quantitative*	✓ The funding came from the Ministry of Public Works , Transport and Environment, covering two thirds of the budget (112.000 million Euros) the other third might be funded by additional income from the European Commission as well as the regional government (having include the restoration and protection of the river and the Mining Basins in the legislative framework)

D. Main agents implicated

The number of agents and their role is very clear in the current Case Study, being already highlighted in **Phase (0)** and **Phase (i)** most of them. But it is necessary to list a few statements:

- The agents that are missing in terms of its importance for the process of recovery of the brownfield is the social or ecologic collectives (being basic in CS1 & CS2). It might be normal the reduced importance of the social platforms compared with the other two cases, being the two previous ones still unresolved cases while the current one has been already faced at the end of the 20th century. At that period of mining '*peak*' the existing social collectives were the syndicates of the mining workers, but their role was not a specific pressure with environmental or landscape restoration concerns. On the contrary, there has been a very active, protesting and movement against the work conditions in the mining demarcations which, according to Maurín Álvarez (1987) were very deficient, emphasizing the mining enterprises the benefits of production instead of the living conditions of the mining workers.
- Also the implication of the enterprise in the process of redevelopment, controlling all the mining demarcations of the Main Mining River Basin (Nalón River), **having a public nature, it might change the priorities of action** (remembering the negative behavior of the two previous polluting enterprises) from the traditional business aim and economic profitability, avoiding negative praxis with the combination between the interest of the enterprise and the lack of political will from the Administration.
- ✓ It is also relevant to comment **the role of the Ministry of Public Works, Transport and Environment, acting as funder and consequently driver of redevelopment**, funding an important part of the first stated regional plan for the remediation of the Mining Basins, while in the other two cases this Ministry was the responsible for the acceptance permission of the discharges developed by the private enterprises in the two previously exposed natural scenarios.

The table below exposes the main agents implicated in the process of recovery of the Nalón River and its Valley:

Actors	Level	Group	Nature* (Indic.1)	Role** (Indicator 2)
• European Commission	Supra-national	Administration	Public	<ul style="list-style-type: none"> It has accepted the application of the region of Asturias for European co-funding applied to the integrating remediation project proposed for the recovery of the basin of the Nalón River
• Ministry of Public Works, Transport & Environment	National	Administration	Public	<ul style="list-style-type: none"> Responsible for the execution of the restoration project of the Nalón River stated by the European Commission, achieved successfully at the end of the 20th century
• Cantabric Hydrographic Confederation	Specific Circumscription for water management	Administration	Public	<ul style="list-style-type: none"> Highest responsible entity for the water management of the Cantabric circumscription The management and the achievement of the works of the restoration EU plan executed by the previous agent
• Principado de Asturias (Regional Government)	Regional	Administration	Public	<ul style="list-style-type: none"> Most important agent after the Town Hall of Langreo, continuing the strategy of integrating plans of a specific area that might benefit the whole regional territory Key application for European funding
• HUNOSA (State Public Mining Enterprise)	Regional	Public entity	Public	<ul style="list-style-type: none"> It absorbed the existing enterprises after its creation in 1967 to try to stop the inevitable shrinkage of the mining activity due to economic reasons
• Town Hall of Langreo	Local	Administration	Public	<ul style="list-style-type: none"> Key agent stating the point of departure of an integrating plan of the municipality with visible effects region-wide Dynamic and ambitious aim to restore the all the contamination heritage in junction with the emphasis on urbanism as well as the economic development through an industrial expansion and shift
• Syndicates of Mining workers	National	Collectives	Syndicate	<ul style="list-style-type: none"> Concern about working conditions, but seems that not a relevant role in the process of redevelopment of the brownfield

Table 31 Chosen Indicators for the Main implicated agents

SELECTED FACTOR	CHOSEN INDICATOR	DRIVER?	REASON	BARRIER?	REASON
<ul style="list-style-type: none"> Physical Appearance 	<ul style="list-style-type: none"> Surface Polluted Volume Pollutants Contamination Period Nature of the pollutants 	<ul style="list-style-type: none"> No No No Yes 	<ul style="list-style-type: none"> There are natural mineral elements (coal) that have not a toxic or radioactive nature 	<ul style="list-style-type: none"> Yes Yes Yes Yes 	<ul style="list-style-type: none"> 47 km of river have suffered a direct pollution Estimation of 5,5 million tons per year Long period of contamination (more than 1 century) Apart of coal, the discharges also contained aggressive substances
<ul style="list-style-type: none"> Land Use 	<ul style="list-style-type: none"> Current Use of the Land 	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> Reusing the mining soil for historic and cultural heritage, equipment and industrial transition 	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> The orography and its subsequent limitations added to the small variety of land use conditioned the transition to new ones
<ul style="list-style-type: none"> Land Tenure 	<ul style="list-style-type: none"> Owner of the affected area 	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> The enterprise in charge has collaborated with the local Administration 	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> This positive attitude might be due to the public nature of the entity
<ul style="list-style-type: none"> Legislation in force 	<ul style="list-style-type: none"> Under which legislation is depending the recovery 	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> The legislation stated at the four possible levels following and integrating aim has supposed the recovery of the area 	<ul style="list-style-type: none"> No 	
<ul style="list-style-type: none"> Cultural Heritage 	<ul style="list-style-type: none"> Inventory of elements Initiatives 	<ul style="list-style-type: none"> Yes Yes 	<ul style="list-style-type: none"> There has been a huge registration of mining elements Successful initiatives to strength on the value of the mining heritage 	<ul style="list-style-type: none"> No No 	
<ul style="list-style-type: none"> Natural Heritage 	<ul style="list-style-type: none"> Existence of Protected Areas 	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> Existence of areas surrounding the Valley not directly affected 	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> Some sections of the river itself is under regimes of protection

Table 32. Identification of Drivers and Barriers Phase (i)

➤ **Phase (iii): Execution of the new uses (Drivers & Barriers)**

- Identification of Drivers and Barriers from Phase (i): Initial Characterization of the Brownfield

SELECTED FACTOR	CHOSEN INDICATOR	DRIVER?	REASON	BARRIER?	REASON?
<ul style="list-style-type: none"> Last Project of Redevelopment 	<ul style="list-style-type: none"> Costs Funding 	<ul style="list-style-type: none"> Yes Yes 	<ul style="list-style-type: none"> The same restoration nowadays would cost many times more The regional government, Ministry of Environment and European Commission assumed the restoration of the Mining Basins 	<ul style="list-style-type: none"> Yes No 	<ul style="list-style-type: none"> The clean and recover the whole aquifer of a river along many kilometers might be expensive (cleaning up + new infrastructures)
<ul style="list-style-type: none"> Main agents implicated 	<ul style="list-style-type: none"> Nature Role 	<ul style="list-style-type: none"> Yes Yes 	<ul style="list-style-type: none"> The public nature of the enterprise in charge of the mining demarcations made easier the collaboration with the Administration at different levels. Very high level of implication from the local level to the supra-national one Crucial political will Awareness of the importance of the recovery of the area for the region 	<ul style="list-style-type: none"> No No 	

Table 33. Identification of Drivers and Barriers Phase (ii)

➤ Identification of Drivers and Barriers from Phase (ii): Planning of New Uses

4.2 COMPARISON OF THE CASE STUDIES

With the exposition and description of the three Case Studies already completed, it is going to achieve now the comparison between them, coming back to the statements belonging to **Section 3**, related with the categorization of drivers and barriers of the selected factors and the identification of the factors of success.

The aim of the comparison, repeated previously in the project, is the identification of the **Factors of Success** among the different previously identified drivers for redevelopment, from the **Phase (iii): Execution of the New Uses** belonging to each of the cases (**CS1**, **CS2** and **CS3**). **It has a valid methodological basis**, coming this distinction of barriers and drivers from the description and identification of the effects of a non-indicative number of characteristic factors selected "*a priori*" through the identification of a common amount of qualitative/quantitative indicators among the three case studies, based on methodological framework already justified and explained (**Section 3**) stated by Gómez Orea (2007). The following figure shows the step among the stated sequential process:



Figure 70. Current position among the sequential process

Insisting on the **validity** of this comparison, now regarding the content of the cases that are aimed to be compared, **the three Case Studies have as well a common basis in terms of conditions and characteristics**: cases with high importance in the country, contamination of soil and water, related with the mining activity, located in environments with high ecological value and following a similar flow of events. Among these three cases **there are**

also differences that make this project pioneer in its aim to find convergences among cases of brownfields in Spain. Among the possible differences it has to be underlined the different status in the process of recovery of the three selected Case Studies, what give a context of contrast among them, being necessary to manage different status to find those factors of success:

- **Case of the Bay of Portmán (CS1): Case unresolved with not even a project of redevelopment currently approved.**
- **Case of the confluence of the Tinto and Odiel Rivers (CS2): Case unresolved with at least a project of restoration approved.**
- **Case of the Nalón Valley (CS3): Case successfully solved with different projects of restoration and redevelopment.**

Moreover, the different location of each case among three Spanish regions (and the divergences that this fact may provoke) states a context of exploration, looking for a potential systematization of the brownfields phenomenon across the Spanish territory.

From this dual distinction of Drivers and Barriers, there are going to be highlighted those “*a priori*” selected factors that have been determinant for the achievement of significant or at least partial improvements in the process of redevelopment, recovery and restoration of a brownfield, through the direct comparison of their characteristic chosen indicators (common among the case studies) that qualify the factors to which they belong to, consequently permitting the discrimination if these act as factors of success or not.

The following two tables are going to display this comparison of the Case Studies. The indicators that appear are those belonging to the **Phases (i)** and **Phase (ii)**, having not the **Phase (0)** any indicator that may qualify the effect of the three representative factors (Location, Justification & Background) and being the objective the comparison of the characterization of these factors as **Drivers (D) green color**, **Barriers (B) red color** or both **(D/B) yellow color**, from **Phase (iii)**, being the findings from these tables analyzed in the next chapter.

FACTORS Phase (i)		INDICATORS Phase (i)		CS1	CS2	CS3
• Physical Appearance	• Surface of Contamination	B	B	B	B	B
	• Volume of the pollutants	B	B	B	B	B
	• Period of Contamination	B	B	B	B	B
	• Nature of the pollutants	D/B	B	D/B	D/B	D/B
• Land Use	• Current Use of the Land	B	B	D/B	D/B	D/B
• Land Tenure	• Owner of the affected area	B	B	D/B	D/B	D/B
• Legislation in force	• Legislation linked with the process of recovery	B	D/B	D	D	D
• Cultural Heritage	• Inventory of elements of cultural heritage	B	----	D	D	D
	• Initiatives related with the cultural heritage	D	----	D	D	D
• Natural Heritage	• Existence of Protected areas	B	D/B	D/B	D/B	D/B

Table 34. Comparison of the “a priori” selected factors Phase

FACTORS Phase (ii)		INDICATORS Phase (ii)		CS1	CS2	CS3
• Last Project of Redevelopment	• Costs of the last project of redevelopment	D/B	B	D/B	D/B	D/B
	• Funding of the last project of redevelopment	B	B	D	D	D
• Main agents implicated	• Nature of main agents implicated	B	B	D	D	D
	• Role of the Main agents implicated	D/B	D/B	D	D	D

Table 35. Comparison of the “a priori” selected factors Phase (ii)

4.3 IDENTIFICATION OF THE FACTORS OF SUCCESS

In this last step of the sequential process, there are going to be commented, summarized and analyzed the findings from the two comparison tables above. Each one of the “*a priori*” selected factors is going to be exposed and analyzed according to the two-folded categorization (Driver/Barrier) of its non-indicative qualitative and quantitative indicators.

The possible findings are based on the evidences of the three Case Studies, so with a **non-exhaustive and indicative characters**.

Phase (i): Initial Characterization of the Brownfield

- **Physical Appearance:** the quantitative indicators of this factor arise that it can't be considered a factor of success due to the fact that the existence of contamination is a causal negative effect. In the chosen scenarios, the brownfield is a bay (CS1), marshlands (CS2) or a whole river (CS3), consequently wide areas with the existence of water that adds more complexity in numerous directions (legislation, cleaning up, environmental damage, uses, etc.). Possibly the nature of the pollutants can be understood as something less negative if these don't have a toxic or radioactive nature (like in CS2). **But in the overall, the physical appearance is by itself and for the brownfields phenomenon considered as something negative if there are evidences of contamination.**

- **Land Use:** its chosen indicator shows that, for a brownfield which contamination comes from the effects of the mining activity, the uses of the land are probably going to be very restricted due to the presence of abandoned infrastructures and conditioned by the previous uses on the terrain, fact that limits considerably the potential shifts into new uses. Another element that might affect the potential uses is the characteristic existing orography where the contaminated area is located (normally complex in the mining environments). Moreover, if these affected areas are surrounded or limiting with others under the regimes of environmental and/or landscape protection, these restrictions might be more evident. This is what happen in CS1 and CS2, where they had surrounding protected areas and even the brownfield itself was supposed to be a protected area (CS2). **The success of this factor, based on the success of the case in Asturias depends on three simultaneous lines of action which common discipline would be the spatial planning, shaping an integrating development that may state a positive context of recovery:**

1. The first one is related with the **synergy between the Land Use and the factor of Cultural heritage (CS3)**, adapting the new uses with the put in value of the historical and cultural buildings and infrastructures located in the affected area and its surroundings (obtaining as well the consensus among the local inhabitants through the promotion of the local identity through the restoration of the local heritage).
 2. The second one is related with the **industrial transition**, in those cases where is necessary a **shift in the productive activity due to the dependency of the local economy on the incomes that come from the mining/industrial discipline**. But for this is necessary first political will from the Administration and the willingness to change from the owner of the affected land.
 3. The third line of action strengthens on the environmental restoration, solving the numerous landscape and environmental impacts created by the mining/industrial activity and, through another **synergy with the cultural heritage, propose new uses where the compatibility between environment, leisure and cultural heritage can be effective and positive, respecting the difficult balance between these three elements**.
- **Land Tenure:** based on the chosen indicator, the success of this factor depends on two interconnected precepts: first the **aim and implication of the owner of the affected area and its willingness into the process of redevelopment of the brownfield and then the nature of that owner**.
1. In relation with the implication, **CS1** showed how the responsible enterprise for the contamination of the area had under control the majority of terrains surrounding the brownfield and how its aim was not compatible with the local collectives; in **CS2** the polluted areas were public domains, what states again the question of the political will from the part of the Administration that gave permission to this enterprise to pollute an area which was not under its property. By contrast, the entity that owned the affected areas in **CS3** collaborated with the local Administration to find an appropriate solution. This cooperation is an important context for success.

2. Then, the nature of the owner may state more or less potential possibilities of success depending on its public or private nature. **CS1** and **CS2**, unresolved brownfield cases with a long period of time between the end of the contamination and nowadays, have last until now with no solution probably influenced by the private nature of the liable enterprise (Portmán Golf for **CS1** and Fertiberia for **CS2**). Private enterprises may have priorities related with economic profitability instead of a comprehensive and integrating site-level purposes that would arise less potential economic benefits. HUNOSA, the public enterprise that owned the majority of the mining demarcations along the Nalón Valley, had to collaborate with the local Administration, being under a public regime that made to commit itself with a way of redevelopment that may not be accepted if its nature would have been private.

- **Legislation in force:** this factor and its link with the potential process of recovery of the brownfield is probably **one of the key potential factors of success, because an appropriate and clear oriented legislative framework would state a context where the different stakeholders of the brownfield would act in accordance to it.** Avoiding the national legislative context for brownfields where there is no specific legislation for the contamination of soil (but assuming it), the choice of the three Case studies arise a complex legislative context (belonging each of the Cases into different Spanish regions and consequently having different legislative instruments). **CS1** is not moving forward due partly to a lack of regional legislative basis (added to the incomplete national one). But **even with the existence of legislative tools is necessary the political will to respect it and make it effective.** The region of Andalucía (**CS2**) had different evidences of legislative tools with more or clear regulations but without any political will to apply it, this legislation might be considered useless. **CS3** is a good example with the junction of clear legislative instruments and the political will of the Administration at every level (local, regional, national and supra-national), compromised with the recovery of the brownfield, being probably the main key of the success.
- **Cultural Heritage:** the emphasis on this factor through its two chosen indicators (inventories and initiatives) can be also considered a relevant success. As it was commented previously in this analysis, the cultural heritage has to be integrated in the redevelopment plan as one of the three pillars for success in conjunction with the industrial transition and the environmental restoration (**CS3**). **Combining it with the**

legislative framework and the land use, there will arise potential solutions that will implicate the social dimension in terms of 'self-esteem' and local identity (CS3) crucial for an agreement with the local collectives. CS1 had, by contrast from the rest of the blocking nature of its factors, a huge emphasis on the recovery and put in value of the mining heritage, what gave a clear idea to the social and ecologic local groups of what were their preferences in terms of possibilities of recovery, facing the opposed ones stated by the private enterprise.

- ***Natural Heritage:*** this factor may follow a similar direction than the previous one related with the local identity and strength on the local assets. But in this case the **success can be more ambiguous as a result of the potential restriction that can exist in a contaminated area if it is surrounded or contained with protected areas** (under regional, national or supra-national regimes), so basically **the success of this factor will be depending on the site-context of the brownfield and the nature of Driver or Barrier that the rest of the selected factors will provide.** For example in **CS1** this factor acted as a barrier added to the restriction imposed by the liable enterprise, what gives a context of immobility for the shift into new comprehensive and integrating land uses; in the **CS2** the polluted area itself was a protected habitat, fact that didn't limit its contamination during 40 years, conditioned by the lack of willingness from the liable enterprises and the lack of political will from the Administration; finally in **CS3** the existence of protected area was not an obstacle for the recovery of the river, on the contrary, it was another complementary element to take into account in the integrated plan of redevelopment.

Phase (ii): Planning of the New Uses

- ***Last Project of Redevelopment:*** another **potential key factor of success in conjunction with an appropriate legislative framework and an effective political will, that has to embrace the local identity of the area through an integrative and comprehensive purpose.** The following two elements have to be taken into account: **the aim of the project and the possibilities of funding to cover the subsequent costs.** The problem comes when these two elements are not compatible.

Regarding the aim of the project, in **CS1** the last project of redevelopment proposed by the enterprise and supported by the Administration was rejected by the local communities due to its **lack of integrating aim** and the evident lack of care regarding the local conditions, provoking a context of blockage in the process of recovery. **CS2** was

one step ahead with the approval of a specific project of restoration imposed by the responsible enterprise, so dismissing the reactions against from the social and ecologic collectives (**not comprehensive**). **CS3** then was successful due to the simple fact that **the project of redevelopment was implied in all the different multi-level legislative tools**, so it was not just a site-level project with short-term objectives, but a whole long-term integrating and multidisciplinary strategy. The example of success arises the statement of the second mentioned element: the funding. With a project of this nature like the one in **CS3** the potential implementation and measures had direct effects on the territorial scale in terms of cohesion, implicating the initiatives coming from the local level to the regional ones. As a result of this cohesive project, the regional Administration obtained the co-funding from the European Union, and consequently the commitment of the Ministry in terms of funding, to cover the subsequent costs.

- **Main agents implicated:** another key factor of success based on the evidences from its chosen indicators. It is visible that among the two indicators, **the nature of the stakeholders might be subordinated to the role they play in the process of recovery (being more important the convergence of purposes in the same direction than the nature of the different agents implicated).**

Starting with the role, in **CS1** and **CS2**, the high implication of the social collectives in both cases was as a result of the different conflicts, scandals and negative initiatives that provoked the influence of the Administration and the responsible enterprises for the pollution. On the contrary, the real implication in **CS3** from the different stakeholders permitted to create a context where the social collectives were not against due to the evident multi-disciplinary aim and the multi-level implication of the Administration in the same direction and common objectives.

As it is affirmed above, the nature of the different entities can be the difference between success and failure, due to the differences between the aim of a private entity (looking for specific benefits) and a public one (with a supposed common benefit for the communities and consequently a stronger compromise with the society). But it is also true that it could exist a case where a private entity collaborated with the Administration for the restoration of a contaminated area, so that is why the nature an agent seems to be subordinated to the role

5 Section 5

5.1 DISCUSSION

The identification of the factors of success based on the evidences of the previous three Case Studies show the complexity of a phenomenon with wide multi-disciplinary implications and multi-scale effects. The identified factors of success have a different weight of influence among the Case Studies and the phenomenon itself in general (having for example not the same relevance an effective legislative framework than the land use of an affected area), consequently it could be a **future line of investigation to weight or score the factors of success according to a specific weighting methodology** (mentioned in **Section 3**).

But showing and summarizing the findings from the previous analysis (**Chapter 4.3**) it could be stated the following figure for an “*a posteriori*” indicative statement of the key interconnections among the identified factors of success:

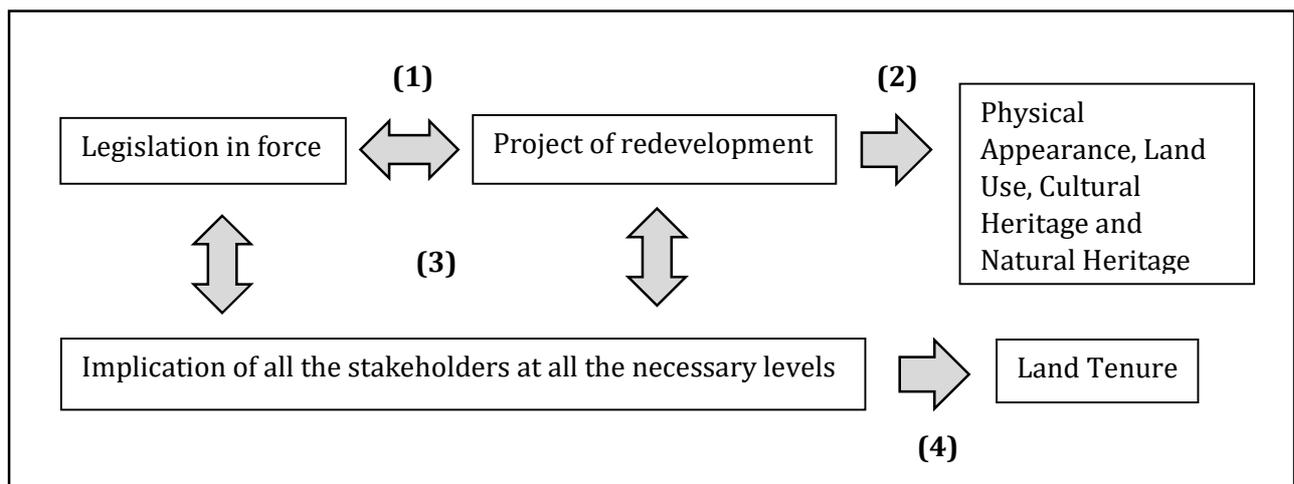


Figure 71. Interconnections between factors of success

The achievement of the recovery of a brownfield case in Spain, based on the evidences and findings after this non-exhaustive analysis, can be reached through the inclusion **(1)** of the project of redevelopment in the legislation in force at all the necessary levels (from local to supra-national), including multidisciplinary implementations **(2)** to reach a and integrating character with evident effects in a site and regional level, through a comprehensive implication **(3)** of all the possible stakeholders to overcome **(4)** potential issues of blockage related with the Land Tenure of the affected area.

So among the factors of success seems to exist an evident context of hierarchy an inter-

dependency among them, provoking potential variations of the previous schema, action-oriented consequences in the situation of tackling a specific brownfield scenario. Another potential **future line of research would be to analyze and explore more deeply these interconnections and hierarchies among the characteristic factors that condition a specific brownfield scenario and its redevelopment.**

In relation with the choice of the described Case Studies **CS1, CS2 and CS3**, it would be appropriate **to extend and continue this line of investigation through a more exhaustive comparison between a more number of cases across the Spanish territory with the final aim of a possible systematization of the processes of recovery, remediation, restoration and redevelopment of a contaminated/derelict/underused area.**

The failure of **CS1 and CS2**, being both still unresolved, present **similar characteristics and conclusions** based on a general lack of political will from all the local, regional and national level of the Administration. Starting with the permission from the Ministry to make effective the discharges of pollutants into a bay (**CS1**) and a protected marshland (**CS2**), continuing with the non-possibility to arrive to an agreement between the stakeholders and promoting and accepting those non-comprehensive and non-integrating solutions proposed by the liable enterprises that prioritize short-term and midway solutions and finishing with the partial attitude against the social and ecologic local collectives.

By contrast, the success of the **CS3** in Asturias, **states a point of departure of probably an exemplary way of action**, being among the three cases the one with the widest extension in terms of scenario and also in terms of the scale of the problem. This case was able to overcome all the negative inputs through:

- Stating **implementations of ‘common sense’**, with the respect and restoration and put in value of the cultural, historical and natural assets inherited.
- Added to **endogenous initiatives** of transition and shift related with the cooperation with the local authorities and the responsible enterprises liable for the pollution or at least owners of the affected areas.
- With a clear **integrating effects that would reinforce the territorial**

cohesion of the area, permitting positive effects all along the region.

- Affecting in consequence the political context with the approval of **regional regulations with direct impact on the affected area.**
- Obtaining as a consequence of this large-scale integrating and comprehensive perspective of the implementations, **national funding and supra-national co-funding, through a clear political will.**

If a case of this size was able to be overcome, many others following the previous precepts might have more possibilities of recovery.

5.2 CONCLUSIONS

This final chapter of the project includes the clarifications regarding the answers of the Problem Formulation, stated and justified in **Section 3**, as an “*a posteriori*” verification of the questions that shape the structure and content of the project, stated “*a priori*”. The problem formulation of this report, embracing one general question and four sub-questions was the following:

- ❖ **Which are the possible success factors that strength the process of revitalization of brownfield cases in Spain?**
 - a) **What is the current ‘picture’ of the brownfields phenomenon in Spain?**
 - b) **What is understood as a ‘*success factor*’?**
 - c) **What are the coincidences and differences between an unresolved case of brownfield and a successful one?**
 - d) **How can the previous statements influence future perspectives of the brownfields phenomenon in Spain?**

Regarding the general question, it has been answered throughout the previous Discussion (**Chapter 5.1**) stating those factors of success obtained from the comparison and analysis of the subsequent findings (**Chapter 4.2** and **4.3** respectively). Sub-question **a**) has been effectively answered in the **Sub-section 1.2.3** through the explanation and pre-analysis of the main characteristic elements and the existing conditions of the brownfields phenomenon in Spain. Following with Sub-question **b**), it has been answered as well in **Sub-section 3.1.1**, throughout the development of the Conceptual. Finally the Sub-questions **c**) and **d**) have been responded also in the Discussion chapter (**5.1**), respectively through on one hand the clarifications regarding the failure of **CS1** and **CS2** and success of **CS3**, and on the other hand stating possible future perspectives and possible future lines of research.

This project has been achieved with the genuine aim of finding positive inputs for a phenomenon that has been conditioning numerous scenarios across the Spanish territory, looking, as it has been mentioned several times, for a certain systematization of the processes of redevelopment, having each of the cases a divergent range of origin, scale, circumstances, agents, legislative framework (regional), physical conditions, etc.

One of its strengths has been the identification of an appropriate methodology related with the Spatial Planning (see **Sub-section 3.1.2**) that has been perfectly adapted to the brownfields phenomenon, stating also a methodological point of departure with a valid sequential process where the numerous elements that shape the phenomenon can be included, analyzed and assessed coherently.

It can be also insisted on the pioneer character of the project, for a phenomenon which awareness in Europe has increased strongly but has not the deserved importance in Spain that it should, according to the huge number of existing cases that are registered and addressed already, and also those numerous ones that haven't been identified and addressed yet.



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APPENDIX A: Spanish Interviews

GUIONES ENTREVISTAS

- 1) Gregorio García (Universidad Politécnica de Cartagena) – written.
- 2) Rafael García Tenorio (Universidad de Sevilla) – spoken

Aclaraciones iniciales:

- Lo primero y más importante, darle las **gracias** por su interés y la posibilidad de ayudarme para el desarrollo de mi tesis de fin de Master.
- Este documento pretende analizar el fenómeno de los “**brownfields**”, referido a zonas contaminadas, abandonadas o infrautilizadas. Se centra en la comparativa cualitativa de tres **Estudios de Casos** concretos que se hayan dado en España (uno en Murcia, otro en Andalucía y uno último en Asturias), de manera que dispongamos de un caso sin resolver y otros dos parcial o totalmente resueltos satisfactoriamente, en busca de posibles coincidencias o patrones con cierta similitud, en busca de identificar posibles **factores de éxito** (*‘success factors’*) que den pie al desarrollo de nuevas iniciativas de revitalización y establezca cierta sistematización para la recuperación de estos espacios. El enfoque, aunque multidisciplinar, está orientado a la **Ordenación del Territorio** y por tanto a los usos del suelo y su gestión (sin menospreciar otros factores como medioambientales, económicos, políticos y sociales, etc.)
- Como especialista en su región, ¿podría sugerirme algún caso de cierta relevancia para la región, de contaminación de suelo, resuelto satisfactoriamente de forma total o parcial, para poder utilizarlo como uno de mis Estudios de Caso y la correspondiente comparación cualitativa? En ese caso, necesitaría de algún **dossier técnico** en el que se desarrolla y desgrana los diferentes pasos realizados, los estudios previos, la planificación de los nuevos usos, su ejecución, etc.

- Como ya le comenté en el correo, las entrevistas pueden ser escritas o por Skype (personalmente prefiero la segunda opción pues se aprende mucho más y el trato es más directo). En este caso, el desarrollo de la entrevista, de duración máxima de una hora, se pretende llevar a cabo la última semana de Abril (**25-29**) por razones de calendario. Mi disponibilidad es absoluta y flexible. Si es posible, sugiérame cuando le vendría bien tener esta charla y así nos podemos ir organizando.
- Para terminar, aclarar que durante nuestra potencial charla por Skype, voy a necesitar grabar la conversación, ya que la universidad nos obliga a registrar en papel las posibles entrevistas realizadas y adjuntarlas como anexos al proyecto.

Preguntas

Estos van a ser los temas que se pretende comentar, a través de las siguientes preguntas (es orientativo, no tiene por qué contestar a todas, o específicamente a lo que se le pregunta):

- a) Descríbame la actual situación de suelos contaminados en España mediante tres-cuatro ideas sencillas.
- b) ¿Utilizan el término '*brownfield*'? En ese caso ¿Cómo lo definirían? ¿Qué ocurre con una infraestructura minera abandonada pero sin peligro de contaminación? ¿Existe algún Marco de actuación para estos casos?
- c) ¿Qué opina de los grandes casos de *brownfields* que se han dado en España como el de Portmán o Aznalcóllar? ¿Hay otros de esa importancia?
- d) ¿Cuál considera que es la situación actual en cuanto a la existencia de un marco legal y legislativo en España para la gestión, control, limpieza y recuperación de suelos contaminados?
- e) ¿Ha oído hablar de algún caso concreto de suelo contaminado en Asturias/Andalucía/Murcia que se haya resuelto parcial o totalmente con éxito? En ese caso ¿Cuál ha sido la clave para la recuperación?

- f)** ¿Cuáles cree usted que deberían ser los factores clave (regulaciones existentes, compromiso político, uso del suelo, compromiso ciudadano), tanto positivos como negativos, para la recuperación o bloqueo de un suelo contaminado en España?
- g)** Sabiendo que en Europa no se dispone de las herramientas estandarizadas necesarias y claras para poder hacer frente a casos de *brownfields* (aunque sí lo tiene para suelos contaminados) y servir de guía para los países miembro, como en otras cuestiones como la gestión del agua por ejemplo, ¿Cómo cree que afecta este hecho a nuestro contexto nacional?
- h)** Entre un marco legal inexistente, la UE y sus agencias insisten mucho en el principio “*polluter pays*” (“*el que contamina paga*”) ¿Este principio se respeta en España? ¿Por qué? ¿Ejemplos?
- i)** ¿Cuáles son los perfiles típicos de *brownfields* en España? ¿Proviene todos de la industria minera? ¿Dónde de la geografía española se encuentran la mayoría?
- j)** ¿Sabe si su Comunidad Autónoma ha realizado con éxito el inventario de lugares contaminados (requisito impuesto por la UE y agencias al cargo a los países miembro), habiendo recibido la competencia directa desde 1995 por ley? Según la UE el País Vasco es la única región con información disponible al respecto.
- k)** Los usos de suelo o su gestión en los casos de contaminación de suelo de su región, ¿suelen ser origen de conflictos o malas prácticas?
- l)** ¿Cuáles cree que son las perspectivas de futuro en cuanto a compromiso político, marco legislativo y legal y el compromiso social para la identificación, limpieza y recuperación de suelos contaminados en España?



RESPUESTAS ENTREVISTAS

1) **Dr. Gregorio García Fernández/ Assistant profesor/ Soil Science and Agricultural Chemistry Unit / Agricultural Science and Technology Department / Technical University of Cartagena (UPCT) – written.**

a) Describame la actual situación de suelos contaminados en España mediante tres-cuatro ideas sencillas.

- *FALTA DE INVENTARIO*
- *CARENCIA DE EVALUACIÓN DE RIESGOS*
- *NORMATIVA INADECUADA*
- *FALTA DE APLICACIÓN EFECTIVA DE LA NORMATIVA EXISTENTE*

b) ¿Utilizan el término 'brownfield'? En ese caso ¿Cómo lo definirían? ¿Qué ocurre con una infraestructura minera abandonada pero sin peligro de contaminación? ¿Existe algún marco de actuación para estos casos?

- *NO, SON COMUNES LOS NOMBRES DE DEPÓSITO DE RESIDUOS, VERTEDERO.*
- *EN GENERAL NO OCURRE NADA, NO SE ACTÚA SOBRE ELLA SALVO QUE TENGA RIESGOS ASOCIADOS (COLAPSO Y ARRASTRE MASIVO DE SEDIMENTOS, POR EJEMPLO)*
- *POR SU PARTE, EN RELACIÓN A LA CONSIDERACIÓN TÉCNICA DE LOS RESIDUOS MINEROS, HAY QUE INDICAR LA DIRECTIVA 2006/21/CE DEL PARLAMENTO EUROPEO Y DEL CONSEJO DE 15 DE MARZO DE 2006, SOBRE LA GESTIÓN DE LOS RESIDUOS DE INDUSTRIAS EXTRACTIVAS ESTABLECIÓ EN SU ARTÍCULO 20 QUE LOS ESTADOS MIEMBROS SE ASEGURARÁN DE QUE SE CONFECCIONE Y ACTUALICE PERIÓDICAMENTE UN INVENTARIO DE LAS INSTALACIONES DE RESIDUOS CERRADAS, QUE SE HARÁ PÚBLICO, Y QUE DEBERÁN TENER EN CUENTA LAS METODOLOGÍAS A LAS QUE SE REFIERE EL ARTÍCULO 21. ESTAS*

METODOLOGÍAS DEBERÁN PERMITIR, POR TANTO, QUE SE ESTABLEZCAN LOS MÉTODOS O PROCEDIMIENTOS DE EVALUACIÓN DEL RIESGO PARA RECONOCER AQUELLAS INSTALACIONES DE RESIDUOS MINEROS QUE TENGAN UN IMPACTO AMBIENTAL GRAVE O QUE PUEDAN CONVERTIRSE A MEDIO O CORTO PLAZO EN UNA AMENAZA GRAVE PARA LA SALUD DE LAS PERSONAS O PARA EL MEDIO AMBIENTE. TRAS LA TRASPOSICIÓN DE LA DIRECTIVA AL DERECHO NACIONAL A TRAVÉS DEL REAL DECRETO 975/2009, SOBRE GESTIÓN DE LOS RESIDUOS DE LAS INDUSTRIAS EXTRACTIVAS Y DE PROTECCIÓN Y REHABILITACIÓN DEL ESPACIO AFECTADO POR ACTIVIDADES MINERAS, SE ESTABLECIÓ QUE, DE ACUERDO CON LA DIRECTIVA, EN EL PLAZO DE CUATRO AÑOS SE ELABORARÍA UN INVENTARIO DE LAS INSTALACIONES DE RESIDUOS MINEROS CLAUSURADAS, CON LA FINALIDAD DE PROCEDER A SU CONTROL, EVALUACIÓN Y MINIMIZACIÓN DE RIESGOS. HASTA AHORA, MÁS DE 6 AÑOS DESPUÉS, LO QUE SE HA HECHO HA SIDO LA ELABORACIÓN DE UN “MANUAL PARA LA EVALUACIÓN DE RIESGOS DE INSTALACIONES DE RESIDUOS DE INDUSTRIAS EXTRACTIVAS CERRADAS O ABANDONADAS” (ALBERRUCHE DEL CAMPO ET AL., 2014), SIN QUE LOS ASPECTOS DE CONTROL EFECTIVO SE HAYAN LLEVADO HASTA EL MOMENTO, AL MENOS EN UNA PROPORCIÓN DESTACABLE.

c) *¿Qué opina de los grandes casos de *brownfields* que se han dado en España como el de Portmán o Aznalcóllar? ¿Hay otros de esa importancia?*

- EN EL PRIMER CASO SE HA DEBIDO A UNA LEGISLACIÓN TOTALMENTE INADECUADA, EN COMBINACIÓN CON UNA PERMISIVIDAD Y FALTA DE CONTROL SOBRE LOS IMPACTOS AMBIENTALES.*
- EN EL SEGUNDO CASO, HA HABIDO UNA FALTA ABSOLUTA DE CONTROL SOBRE LA ACTIVIDAD MINERAL Y SUS DEPÓSITOS DE RESIDUOS.*
- NO CONOZCO OTROS DE ESAS CARACTERÍSTICAS.*

d) *¿Cuál considera que es la situación actual en cuanto a la existencia de un marco legal y legislativo en España para la gestión, control, limpieza y recuperación de suelos contaminados?*

- LA REGULACIÓN NORMATIVA ACTUAL DE LA GESTIÓN DE SUELOS CONTAMINADOS VIENE RECOGIDA EN LA LEY 22/2011, DE 28 DE JULIO, DE RESIDUOS Y SUELOS CONTAMINADOS (LRSC), QUE REGULA DOS MATERIAS: EL*

MARCO GENERAL DE LOS RESIDUOS Y SU GESTIÓN, Y LOS SUELOS CONTAMINADOS. A SU VEZ, LA LEGISLACIÓN BÁSICA EN MATERIA DE PROTECCIÓN DE SUELOS, LRSC, SE ENCUENTRA DESARROLLADA POR EL RD 9/2005 PARA EL CASO CONCRETO DE LOS SUELOS CONTAMINADOS. A ESTE RESPECTO, SERÍA MUY POSITIVO LA PROMULGACIÓN DE UNA LEY O NORMATIVA PROPIA DEL SUELO, DADA LA GRAN TRASCENDENCIA AMBIENTAL Y HUMANA QUE ESTE RECURSO TIENE, INCLUIDOS TODOS LOS ASPECTOS RELACIONADOS CON SU CONTAMINACIÓN Y DEGRADACIÓN.

- LA LRSC MANTIENE VIGENTE EL RD 9/2005, POR LO QUE SE ENCUENTRA DESARROLLADA POR EL MISMO REGLAMENTO QUE LA ANTERIOR NORMATIVA, LR, DEROGADA POR LA LRSC. LA LEY 22/2011 ENCOMIENDA AL GOBIERNO NUEVAMENTE LA PUBLICACIÓN DE UNA LISTA DE ACTIVIDADES POTENCIALMENTE CONTAMINANTES DEL SUELO MEDIANTE DESARROLLO REGLAMENTARIO (ART.33.1), ESTANDO AÚN PENDIENTE ESTE NUEVO DESARROLLO REGLAMENTARIO, POR LO QUE SUPLETORIAMENTE, Y EN LO QUE NO CONTRADIGA LA LEY 22/2011, SE SEGUIRÁ APLICANDO EL RD 9/2005. ESTE NUEVO REGLAMENTO DEBERÍA HABER SIDO YA ELABORADO POR LA COMISIÓN DE COORDINACIÓN EN MATERIA DE RESIDUOS, YA QUE EL PLAZO LEGAL ACABÓ EN 2014 Y QUE SIGUE SIN LLEVARSE A CABO. POR TANTO, SERÍA NECESARIO, IGUALMENTE, ADAPTAR LA LRSC AL NUEVO MARCO NORMATIVO VIGENTE, DE TAL FORMA QUE SU REFERENCIA EN RELACIÓN A LOS SUELOS CONTAMINADOS NO FUESE EL DEL RDSC SINO UNA NORMA MÁS ACTUALIZADA.
- LAS ZONAS MINERAS INCLUYEN SUELOS NATURALES, ESCOMBRERAS Y DEPÓSITOS, O BALSAS, DE RESIDUOS O LODOS MINEROS, QUE CONFORMAN FINALMENTE EL SUELO MINERO QUE JURÍDICAMENTE TENDRÁ LA CONSIDERACIÓN DE RESIDUO MINERO, A NUESTRO PARECER. PERO LA EXCLUSIÓN DE LOS SUELOS MINEROS CONTAMINADOS, EN LA NORMATIVA RELATIVA A SUELOS, SUPONE UNA CARENCIA LEGISLATIVA. IGUALMENTE, SE DEBERÍAN CONSIDERAR LOS SUELOS DE NUEVA FORMACIÓN Y ESPECÍFICOS DE ESTOS AMBIENTES MINEROS, SURGIDOS A PARTIR DE LA ACCIÓN DE LOS FACTORES Y PROCESOS EDAFOGENÉTICOS SOBRE LA SUPERFICIE DE LOS DEPÓSITOS DE LOS RESIDUOS MINEROS. EN NUESTRA OPINIÓN, AL TRATARSE DE UN RECURSO, EL SUELO, AFECTADO EN MAYOR O MENOR MEDIDA POR LOS RESIDUOS MINEROS, SEAN ESTOS INERTES O TÓXICOS, DEBERÍA SER CONSIDERADO COMO UN OBJETO JURÍDICO DIFERENCIADO DE LOS PROPIOS RESIDUOS MINEROS, DEBIENDO RECIBIR, EN CONSECUENCIA, UN

TRATAMIENTO TOTALMENTE DIFERENTE (RECURSO, SUBPRODUCTO O SUELO), ALGO QUE NO OCURRE EN LA ACTUALIDAD CON LA NORMATIVA VIGENTE QUE REGULA ESTE TEMA.

- *POR OTRO LADO, EN RELACIÓN A LOS NIVELES LÍMITE, O DE REFERENCIA, UTILIZADOS POR LAS DISTINTAS LEGISLACIONES PARA ESTABLECER LOS VALORES ELEMENTALES DE CONTAMINACIÓN, O DE INTERVENCIÓN, EN LOS SUELOS, SON DIVERSAS LAS CARENCIAS, ALGUNAS DE ELLAS DE GRAN TRASCENDENCIA, SEGÚN NUESTRO CRITERIO. EN PRIMER LUGAR, LA PRIMERA Y PRINCIPAL CARENCIA DE ESTAS NORMATIVAS SE DETECTA EN RELACIÓN CON LA ESPECIE, O FRACCIÓN METÁLICA, CONSIDERADA. EN ESTE SENTIDO, SE NECESITA UNA MODERNIZACIÓN DE LOS CRITERIOS TÉCNICOS PARA DECLARAR UN SUELO COMO CONTAMINADO, EN PARTICULAR RESPECTO DE LOS ELEMENTOS TRAZA, CON LA FINALIDAD DE ADAPTAR EL MARCO NORMATIVO AL GRADO DE CONOCIMIENTO CIENTÍFICO-TÉCNICO ACTUAL BASADO EN ESTUDIOS DE EXTRACCIONES SECUENCIALES Y FRACCIONAMIENTO DE LOS ELEMENTOS TRAZA ESTUDIADOS.*
 - *IGUALMENTE, DADA LA GRAN CANTIDAD DE METODOLOGÍAS Y PROTOCOLOS PARA LA EVALUACIÓN DE LA TOXICIDAD Y RIESGO ASOCIADO A LOS SUELOS CONTAMINADOS, EN PARTICULAR POR ELEMENTOS TRAZA, SE REQUIERE DE UNA ESTANDARIZACIÓN, DE UNA HOMOGENEIZACIÓN DE ESTOS PROTOCOLOS RESPECTO DE LOS REQUISITOS TÉCNICOS, DE TAL FORMA QUE EL MARCO NORMATIVO VIGENTE RECOMIENDE METODOLOGÍAS Y CRITERIOS DE EVALUACIÓN DE LA CONTAMINACIÓN, TOXICIDAD Y RIESGOS, COMUNES QUE PERMITAN COMPARAR LOS RESULTADOS EN DIFERENTES ÁMBITOS. ESTA CUESTIÓN, SIN DUDA, FACILITARÍA EL TRABAJO DE CONTROL Y MANEJOS DE LOS SUELOS CONTAMINADOS AL UNIFORMIZAR METODOLOGÍAS Y PROTOCOLOS AVANZADOS CAPACES DE GENERAR RESULTADOS COMPARABLES EN DIFERENTES ÁMBITOS. EN NUESTRA OPINIÓN, ESTE DEBE SER OTRO DE LOS PUNTOS FUNDAMENTALES EN LOS QUE LA NORMA DEBERÍA AVANZAR EN UN FUTURO PRÓXIMO.*
- e) ¿Ha oído hablar de algún caso concreto de suelo contaminado en Asturias/Andalucía que se haya resuelto parcial o totalmente con éxito? En ese caso ¿Cuál ha sido la clave para la recuperación?

- *EL CASO DE AZNALCÓLLAR, AL SER LLEVADA A CABO SU RESTAURACIÓN Y/O MINIMIZACIÓN DE RIESGOS POR CIENTÍFICOS ESPECIALISTAS EN ESTE CAMPO.*
- f)** ¿Cuáles cree usted que deberían ser los factores clave (regulaciones existentes, compromiso político, uso del suelo, compromiso ciudadano), tanto positivos como negativos, para la recuperación o bloqueo de un suelo contaminado en España?
- *A MODO DE RESUMEN, EN NUESTRA OPINIÓN ES MUCHO EN LO QUE LA NORMATIVA RELATIVA A SUELOS MINEROS, Y CONTAMINADOS EN GENERAL, DEBE AVANZAR PARA ADECUARSE AL CONOCIMIENTO DISPONIBLE HOY DÍA, Y POR TANTO DE UNA MEJOR Y MÁS ADECUADA GESTIÓN DE ESTE RECURSO AFECTADO POR ELEMENTOS TRAZA. EN OTRAS PALABRAS, CONSIDERAMOS COMO BÁSICA LA ELABORACIÓN DE UNA NORMATIVA PROPIA, ACTUALIZADA AL CONOCIMIENTO CIENTÍFICO-TÉCNICO ACTUAL Y A LAS PECULIARIDADES DE ESTOS SUELOS CONTAMINADOS, EN GENERAL, Y MINEROS, EN PARTICULAR.*
 - *CAMBIO DE MENTALIDAD GENERAL RESPECTO DEL VALOR, IMPORTANCIA Y NECESIDAD DE LOS RECURSOS NATURALES COMO GARANTÍA DE FUTURO PARA EL PLANETA Y LA HUMANIDAD.*
- g)** Sabiendo que en Europa no se dispone de las herramientas estandarizadas necesarias y claras para poder hacer frente a casos de *brownfields* (aunque sí lo tiene para suelos contaminados) y servir de guía para los países miembros, como en otras cuestiones como la gestión del agua por ejemplo, ¿Cómo cree que afecta este hecho a nuestro contexto nacional?
- *MUCHOS DE LOS ASPECTOS DE REGULACIÓN DE CUESTIONES RELACIONADAS CON EL MEDIOAMBIENTE CON AFECCIONES SOBRE LA ACTIVIDAD ECONÓMICA. SOLO SE APLICAN, REGULAN O CONTROLAN CUANDO VIENEN “OBLIGADOS” POR NORMATIVAS EUROPEAS DE SUPERIOR RANGO Y OBLIGADO CUMPLIMIENTO. POR TANTO, ESTE TIPO DE NORMAS DE ÁMBITO EUROPEO RESULTAN ESENCIALES PARA SU IMPLANTACIÓN EN EL CONTEXTO NACIONAL.*
- h)** Entre un marco legal inexistente, la UE y sus agencias insisten mucho en el principio “*polluter pays*” (“*el que contamina paga*”) ¿Este principio se respeta en España? ¿Por qué? ¿Ejemplos?

- *NO SE RESPETA EN ESPAÑA, EN TÉRMINOS GENERALES.*
 - *POSIBLEMENTE POR FALTA DE UNA NORMATIVA EFECTIVA, ASÍ COMO DEL CONTROL DE SU APLICACIÓN.*
 - *EL CASO DE AZNALCÓLLAR, EN DONDE LA EMPRESA MULTANACIONAL RESPONSABLE, LA SUECA BOLIDEN, NO ASUMIÓ SU RESPONSABILIDAD PATRIMONIAL PARA HACER CARGO A LA RESTAURACIÓN DEL DESASTRE PROVOCADO.*
- i)** ¿Cuáles son los perfiles típicos de *brownfields* en España? ¿Proviene todos de la industria minera? ¿Dónde de la geografía española se encuentran la mayoría?
- *LA MAYORÍA DE LOS SUELOS CONTAMINADOS ESTÁN ASOCIADOS A EMPLAZAMIENTOS INDUSTRIALES, SI BIEN LA IMPORTANCIA RELATIVA DE LOS EMPLAZAMIENTOS MINEROS (SOBRE TODO DE MINERÍA METÁLICA) ES MUY GRANDE COMO CONSECUENCIA DE LOS ALTOS NIVELES DE CONTAMINACIÓN Y DE AFECCIÓN SOBRE LA SALUD AMBIENTAL DE SU ENTORNO.*
 - *LOS EMPLAZAMIENTOS DE MINERÍA METÁLICA SE LOCALIZAN EN SU MAYOR PARTE EN LA LLAMADA “FRANJA PIRÍTICA”, DESDE RÍO TINTO (HUELVA) A LA SIERRA MINERA DE CARTAGENA-LA UNIÓN (MURCIA), PASANDO POR SIERRA ALMAGRERA (ALMERÍA), ALMADÉN (CIUDAD REAL), ETC., ADEMÁS DE OTROS EMPLAZAMIENTOS DISTRIBUIDOS POR LA GEOGRAFÍA NACIONAL. LOS EMPLAZAMIENTOS CONTAMINADOS POR ACTIVIDADES INDUSTRIALES ESTÁN LOCALIZADOS, BÁSICAMENTE, EN LAS ZONAS QUE SUSTENTAN ESTAS ACTIVIDADES, ESTANDO DISTRIBUIDOS POR TODO EL TERRITORIO NACIONAL.*
- j)** ¿Sabe si su Comunidad Autónoma ha realizado con éxito el inventario de lugares contaminados (requisito impuesto por la UE y agencias al cargo a los países miembro), habiendo recibido la competencia directa desde 1995 por ley? Según la UE el País Vasco es la única región con información disponible al respecto.
- *NO, QUE ME CONSTE.*
- k)** Los usos de suelo o su gestión en los casos de contaminación de suelo de su región, ¿suelen ser origen de conflictos o malas prácticas?

- *BÁSICAMENTE DE MALAS PRÁCTICAS, EN MUCHOS CASOS COMO CONSECUENCIA DE UNA MALA LEGISLACIÓN.*

1) ¿Cuáles cree que son las perspectivas de futuro en cuanto a compromiso político, marco legislativo y legal y el compromiso social para la identificación, limpieza y recuperación de suelos contaminados en España?

- *EN LA MEDIDA EN LA QUE LOS PROBLEMAS Y CONSECUENCIAS DE LOS SUELOS CONTAMINADOS SE VUELVAN INSOSTENIBLES, Y SOBRE TODO QUE TENGAN CONSECUENCIAS IMPORTANTES SOBRE LA ACTIVIDAD ECONÓMICA Y LA SALUD PÚBLICA, ES PREVISIBLE QUE DESDE EL ÁMBITO POLÍTICO SE ADOPTEN NORMATIVAS MÁS AVANZADAS QUE ESTÉN ADAPTADAS AL NIVEL DE CONOCIMIENTO CIENTÍFICO SOBRE LA MATERIA QUE PERMITAN HACER UNA EVALUACIÓN DE RIESGOS Y PROPONER UNA MEDIDAS DE MINIMIZACIÓN DE RIESGOS Y DE RESTAURACIÓN MÁS EFECTIVAS.*

2) Rafael García Tenorio (Universidad de Sevilla) – spoken



APPENDIX B: English Interviews

INTERVIEWS OUTLINE

- 1) Xiaonuo Li (University of Brighton) - written
- 2) Ana Payá-Pérez (Joint Research Center, European Commission) – written & spoken – pending to transcript

Initial clarifications:

- First and most important, thank you for your interest and the possibility of helping me in the achievement of the Master Thesis.
- This thesis pretends to analyze the brownfields phenomenon, referred to contaminated, abandoned o derelict lands. It focuses in the qualitative comparison of **three Case Studies** developed in Spain (each in a different region), having one unresolved case and two partially or totally solved, and looking of possible coincidences or patterns for the identification of the **Factors of Success**. This identification may create a context of systematization and the foundation of new initiatives of revitalization in the future for other Spanish cases. The emphasis, even if the content is multidisciplinary, is orientated to the **Land Management** and consequently the land use and land tenure (adding other factors such as environment, economics, politics and social, among others).
- As I already commented this issue in the previous email; the interview can be answered by writing or through Skype (personally I prefer the second option, having the possibility of learning more). In this case, the interview should be fixed for week 17 (**25th – 29th of April**) due to calendar issues. My availability is absolute and flexible.
- At last, I would like to clarify that during this potential interview through Skype, I will need to record the conversation, due to the reason that the university asks to register on paper the different interviews achieved and attach them as annexes to the project.

Questions

These are going to be the topics that are pretended to be commented, through the following questions (is just illustrative, you don't need to answer to all of them):

- a) Describe the current 'picture' of the brownfields in Europe through 3-4 key ideas.
- b) It is known that there is no a specific European legal framework for brownfields, which consequences can provoke this fact for the country members like Spain for example?
- c) Briefly what are the main differences between the management of brownfields in Europe and the U.S. / Asia?
- d) Which are some of the most well-known case of brownfields revitalized successfully in Europe? What the reasons/factors of this success?
- e) Have you heard about a specific case of brownfields in Spain? Which one? What were the results?
- f) Assuming that the EU doesn't provide standardized tools for the evaluation, assessment, control, identification of brownfields. Which tools are available to use? From which agency/network? Examples
- g) What happen with those areas of Europe that are outside the footprint of well-known brownfields networks such as NICOLE, CLARINET; CABERNET, etc.?
- h) There is no a specific EU Directive for brownfields, but some regarding waste management and soil contamination, It is crucially needed a clear supra-national Directive for brownfields?
- i) With not a common agreement even on the definition, typologies, scale and other issues of the brownfields phenomenon, you understand that this context of void and confusion can be seen as a barriers for the effective redevelopment of brownfields in the country members?
- j) Why there is always an emphasis on economic factors, with cultural, social and environmental being normally dismissed?

k) What is the short term horizon of improvement for brownfields in Europe?



INTERVIEWS ANSWER

- 1) Xiaonuo Li (University of Brighton) - written
- 2) Ana Payá-Pérez (Joint Research Center, European Commission) – written & spoken – pending to transcript

1) Xiaonuo Li / PhD Researcher in School of Environment and Technology / University of Brighton – written

- a) Describe the current ‘picture’ of the brownfields in Europe through 3-4 key ideas.
First, focus on site sustainable management from the initial project design to the soft end use.
Second, emphasize the overall services/benefits of brownfields redevelopment such as carbon storage/sequestration, new energy regeneration and ecological service rehabilitating.
Third,
- b) It is known that there is no a specific European legal framework for brownfields, which consequences can provoke this fact for the country members like Spain for example?

As we all know, there is the Soil Framework Directive which is intended to set common principles and objectives at EU level. But it doesn't work mainly due to some Member States maintaining that soil was not a matter to be negotiated at the European level. Others felt that the cost of the directive would be too high, and that the burden of implementation would be too heavy.

c) Briefly what are the main differences between the management of brownfields in

Europe and the U.S. / Asia?

To effectively address contaminated sites, strategies through a variety of soil protection policies have been implemented in the US, Canada, Japan and Europe during the last 20 to 30 years. In which, the Comprehensive Environmental Response Compensation and Liabilities Act (CERCLA, 1980) commonly referred to as Superfund (USEPA, 1980) was considered as the most representative law for contaminated sites management in the world and a prototype for law establishment of many other countries managing contaminated sites.

In China, contaminated site has become a new and serious environmental problem with the process of relocating old and polluting industries from urban centers due to upgrade of industrial structure and adjustment of urban layout. Chinese government has tried hard to take measures to address problems related with brownfields such as food safety and group poison. But by far, there still huge gap between China and other developed countries in terms of policy formulation, practical implementation, technical innovation, stakeholder participation, financial support and so on.

In recent years, the central government has introduced numerous policies such as Recommendations on Strengthening Soil Contamination Prevention and Remediation (2008) and Technical Guidelines for Site Soil Remediation (2014).

- d)** Which are some of the most well-known case of brownfields revitalized successfully in Europe? What the reasons/factors of this success?

I indeed know some cases of brownfields revitalized successfully but I'm not sure if they are the most well-known, for example, the Port Sunlight River Park regenerated on a former landfill and Betteshanger Country Park on a former spoil tip. At least in the UK, soft end uses of brownfields, such as for greenspace or biomass production is widely considered a key measure to mitigate potential/identified risks, prevent further urban sprawl, reduce additional land take and provide wider services which improve overall sustainability.

- e)** Have you heard about a specific case of brownfields in Spain? Which one? What were the results?

Sorry but no.

- f)** Assuming that the EU doesn't provide standardized tools for the evaluation, assessment, control, identification of brownfields. Which tools are available to use? From which agency/network? Examples

(1) *CLAIRE/SuRF-UK: a sustainable framework for brownfields remediation and reuse.*

http://www.claire.co.uk/index.php?option=com_content&view=category&id=963&Itemid=78

(2) *Network for Industrially Contaminated Land in Europe (NICOLE):*

<http://www.nicole.org/>

(3) *Dutch Standards: Target values for groundwater and intervention values for soil and*

Groundwater, Groundwater target values and indicative levels for serious contamination

<http://www.esdat.com.au/Environmental%20Standards/Dutch/ENGELSE%20versie%20circulaire%20Bodemsanering%202009.pdf>

- g)** What happen with those areas of Europe that are outside the footprint of well-known brownfields networks such as NICOLE, CLARINET; CABERNET, etc.?

Sorry but I have no idea about this and have never thought this question before, if you can find the answers (maybe from other experts) it's indeed a quiet good view for your thesis.

- h)** There is no a specific EU Directive for brownfields, but some regarding waste management and soil contamination, It is crucially needed a clear supra-national Directive for brownfields?

I think there is already an effective legal framework in many countries in Europe (e.g. Netherlands and the UK) for brownfields management and also many successful implementations. I'm not sure how long it will take to develop a specific EU Directive (but for China it's a long time for a new policy to release, maybe many years). So I don't suggest a specific EU Directive for brownfields in the current context of Europe.

- i)** With not a common agreement even on the definition, typologies, scale and other issues of the brownfields phenomenon, you understand that this context of void

and confusion can be seen as a barriers for the effective redevelopment of brownfields in the country members?

Yes, definitely. But it's quiet difficult to make an agreement on these issues you referred considering that the context (e.g. geological, social, cultural and technical factors) is different among different countries. And even though there is an agreement, it must be a general and vague definition which will only play a trivial role in guiding brownfields management. In my opinion, it's more possible that country members will still take country-based / site-based measures to reuse brownfields regardless of the common agreement. Additionally, other elements such as stakeholders, urban development planning, economic benefits and land reuse pressure are also key points for the effective redevelopment of brownfields in the country members.

- j)** Why there is always an emphasis on economic factors, with cultural, social and environmental being normally dismissed?

It's a common phenomenon world widely existing and cannot be changed in short term. I think the reason is that the economic element is tangible and can be measured in monetary items, while, other factors are intangible and difficult to be monetized in a market price. Though a number of researches have been carried out to quantify, there still are contentious (e.g. on methodology) among different stakeholders and high uncertainties.

- k)** What is the short term horizon of improvement for brownfields in Europe?

Compared with China, the current situation of brownfields in Europe is much better and can provide many successful experiences both in theory and practice to Chinese brownfields management, so I have no idea about how to improve.

2) Ana Payá-Pérez/ Land Resource Management & SOIL action Units / Scientific Officer & Project leader on Contaminated Sites / European Commission Institute for Environment and Sustainability – written &

spoken

Disclaimer: "This replies are the personal opinions of the author and does not necessarily reflect the official opinion of the Commission"

- a) Describe the current 'picture' of the brownfields phenomenon in Europe through 3-4 key ideas.

Firstly: At the present economic crisis and demand for resources and space in European cities the brownfields represent an opportunity for development, innovation and job opportunities;

Secondly: The knowledge gathered through European Networks like CABERNET (2007) and HOMBRE (2015)¹ have contributed to share the best practices among highly industrialized countries like UK, the Netherlands, Germany, Italy and Belgium and the transfer of know-how to other countries of the European Economic Area.

Thirdly: Brownfields are representing profitable case studies for developing sustainable urban land management and real opportunities to develop new models for better understanding the complexity of dynamic city systems.

- b) It is known that there is no a specific European legal framework for brownfields, which consequences can provoke this fact for the country members like Spain for example?

Work on "Land as a resource" started from the 2011 resource efficiency roadmap (http://ec.europa.eu/environment/resource_efficiency/about/roadmap/index_en.htm), and is also reflected in the 7th EAP (legal basis). The aim is to develop robust indicators, as well as create a baseline and policy scenarios on land degradation, land take and land use efficiency. The principle of land functions is at the core of the work, and coherence is sought between past trends (from Corine Land Cover) and the future (LUIA modelling platform). The planned communication on "Land as a resource", though, is still pending, after the new Juncker Commission revision of priorities. We expect the EC initiatives to be in line with global policy developments. The Sustainable Development Goals reiterate the call for a land degradation neutral world in the context of sustainable development (SDG 15.3, <http://www.un.org/sustainabledevelopment/biodiversity/>), first formulated in the Rio+20 outcome document "The future we want".

¹ HOMBRE-Holistic Management of Brownfield Regeneration; www.zerobrownfields.eu

Nevertheless, examples from diverse urbanized contexts in Europe illustrate that public and private policy instruments for soil protection and land resource efficiency in urbanized areas exist. The public instruments include regulatory measures, price- and market-based economic incentives and broader awareness-raising instruments, including public financing for innovation or for outreach and education.

- c) Briefly what are the main differences between the management of brownfields in Europe and the U.S. / Asia?

I cannot reply to this question since I am new in this area of brownfields and urban land management.

- d) Which are some of the most well-known case of brownfields revitalized successfully in Europe? What the reasons/factors of this success?

A lot of good work on brownfield revitalization has been carried out in Europe however most of these cases are only known at national level, and mainly reported in the national language. Today EU 28 speaks 22 official languages which do not facilitate the exchange between practitioners and the general public.

The Commission JRC- EIONET publication "Remediated sites and brownfields – Success stories in Europe" (2015) reports 13 successful cases of brownfield remediation.

In Portugal: *Park of Nations: an example of soil decontamination and urban regeneration of a brownfield site in the city of Lisbon*

In France: *Rehabilitation of the former gas plant in Cannes, France, to its redevelopment of a mixed development zone and Urban development of the Rhône-Saône confluence, France*

In Switzerland: *Remediation of a former gas plant site in Delémont, in the canton of Jura, land recycling in the city centre and the Remediation and monitoring of a commercial site in Carouge, in the canton of Geneva having chromium (VI) contamination in the groundwater;*

In Belgium: *The Bois Saint-Jean site in Seraing,; various types of pollution and a large site remediation with special techniques and The gasworks-site in Mons, Belgium: remediation of an old site to build offices and a housing project.*

The Tubize Plastics site in Tubize, Belgium: the story of fast remediation work for

a building project;

The Cokerie Flemalle site in Flemalle and Seraing, Belgium: development of a trimodal platform and a business park.

In Austria: *Remediation of Austria's largest gasworks-site, transforming it into a new city quarter*

In Italy: *Redevelopment of brownfields in the urban context of Porto Marghera, Venice.*

- e)** Have you heard about a specific case of brownfields in Spain? Which one? What were the results?

In Spain:

Microbiological remediation of soil contaminated with thermo oil in Extremadura;

Assessing remediation strategies in a complex fractured bedrock aquifer polluted by chlorinated volatile organic compounds at a former production site, in Catalonia, Spain.

In Bilbao the regeneration of the Estuary River with the construction of the Guggenheim Museum, the new Conference Centre and Music Hall among other works.

- f)** Assuming that the EU doesn't provide standardized tools for the evaluation, assessment, control, identification of brownfields. Which tools are available to use? From which agency/network? Examples

The HOMBRE (Holistic Management of Brownfield Regeneration) project provides with tools and methodologies for brownfield redevelopment.

- g)** What happen with those areas of Europe that are outside the footprint of well-known brownfields networks such as NICOLE, CLARINET; CABERNET, etc.?

In my personal understanding I consider all these networks excellent examples of collaboration and sharing of best practices, not only for its members but for countries that wish to redevelop abandoned, underused or derelict urban areas.

- h)** There isn't any specific EU Directive for brownfields, but some regarding waste management and soil contamination, It is crucially needed a clear supra-national Directive for brownfields?

Brownfields have been defined within the CABERNET works and they are understood generally in terms of candidate redevelopment sites as opposite of a Greenfield sites. The expected Commission Communication "Land as a Resource" should provide the basis for a legislative framework for Sustainable Land Management in Europe.

- i) With not a common agreement even on the definition, typologies, scale and other issues of the brownfields phenomenon, you understand that this context of void and confusion can be seen as a barriers for the effective redevelopment of brownfields in the country members?

We need a European legal framework that helps enterprises, consultancies and companies to overcome administrative, financial, and legal barriers to operate in a similar way from country to country. I am convinced that a common legal framework will bring common tools and methodologies for the sustainable regeneration of brownfields and creation of jobs and market opportunities in many ex-industrial cities.

- j) Why there is always an emphasis on economic factors, with cultural, social and environmental being normally dismissed?

Luckily, in the economic analysis of urban planning, politician and stakeholders have started considering the cultural, social and environmental values of regenerating brownfields.

The Road Map 2011 for a Resource Efficient Europe is developing measures to achieve a "No Net Land Take by 2050". It outlines how we can transform Europe's economy into a sustainable one by 2050. It proposes ways to increase resource productivity and decouple economic growth from resource use and its environmental impact. Key resources are analyzed from a life-cycle and value-chain perspective. Nutrition, housing and mobility are the sectors responsible for most environmental impacts; actions in these areas are being proposed to complement existing measures.

European countries are engaged in the recently adopted Sustainable Development Goals by the UN in September 2015, in particular Goal 15.3 (By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world) aims to protect fertile soil for food production and to possibly building on land that has already been sealed by roads or by industrial sites. By definition a brownfield

is an unused land that could be re-naturalized into parks or gardens creating a more pleasant urban environment. Luckily new methodologies are under development, allocating more value to cultural, social and environmental aspects. A good example is the regeneration of the Bilbao River Estuary where a combination of public and private parties have supported the environmental regeneration and other community services using urban development as a source of funding for the construction of the Guggenheim Museum, the new Conference Centre and Music Hall among other works.

- k)** What is the short term horizon of improvement for brownfields in Europe? What should be improved?

The European Commission is aware of the importance of promoting sustainable land management and brownfields are an important resource in urban areas. The topic is open for discussion at technical level with groups of experts (EEA Scientific Committee Workshop on October 2016 will focus on "Land as a Resource") meeting to analyze how the demand for soil in urban areas can be managed optimally, and how their use and management practices from country to country, region to region make a difference in generating benefits to society.