



# **SUSTAINABILITY OF THE EXTRACTIVE INDUSTRY IN *MACIÇO CALCÁRIO ESTREMENHO* (PORTUGAL)**

## **A case Study for the Inclusion of Mineral Resources in Land Use Planning**

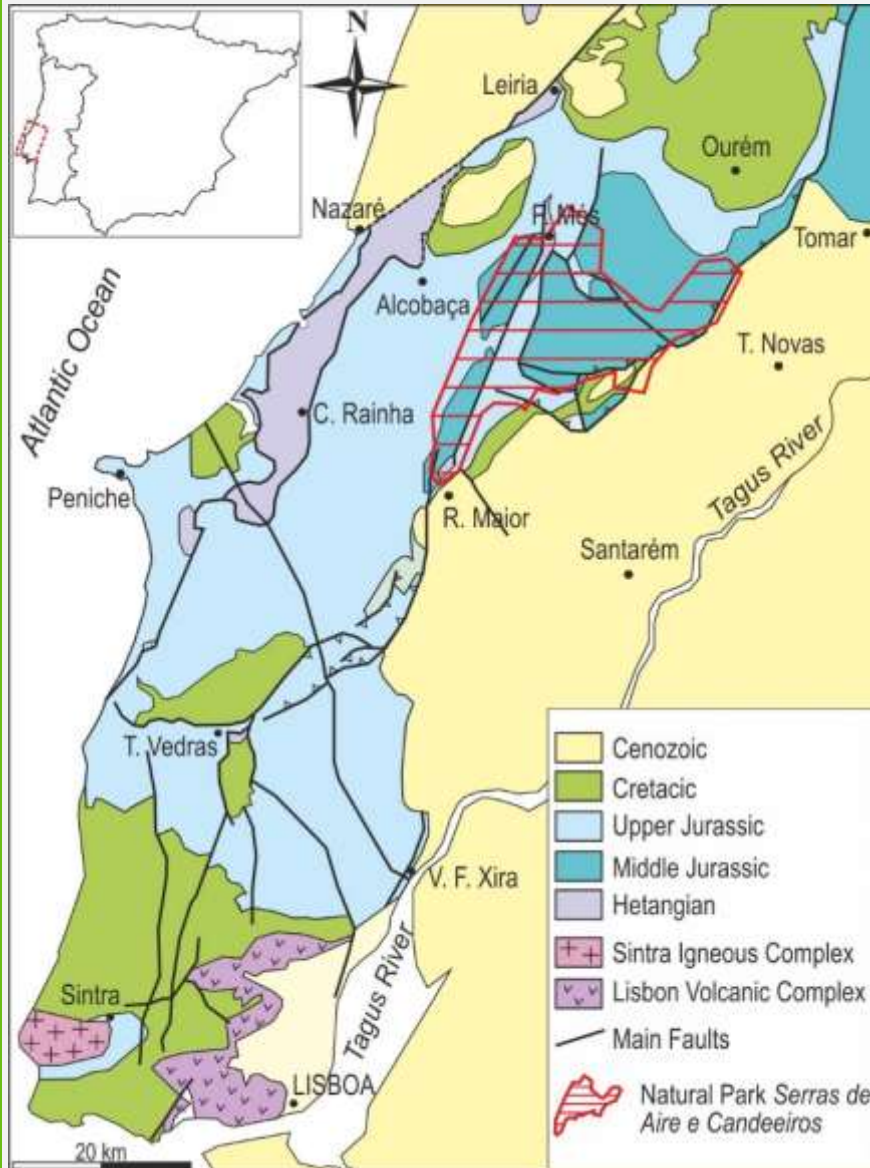
**Jorge Carvalho**

MinLand Kick-Off Meeting, 11 – 12 January 2018.

Uppsala, Sweden

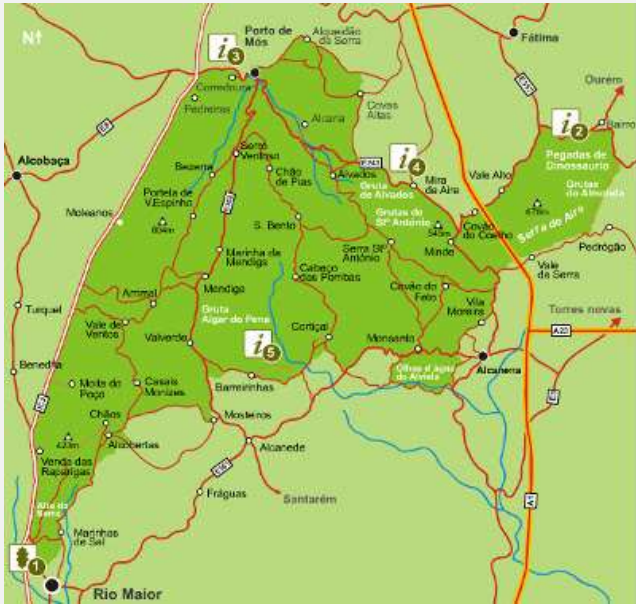
# MACIÇO CALCÁRIO ESTREMENHO (MCE)

## Estremenho Limestone Massif



- Located in the Central Sector of the Lusitanian Basin
- Mostly Middle and Upper Jurassic Limestones
- Mostly covered by a Natural Park – The Natural Park of *Serras de Aire e Candeeiros (PNSAC)*
- Included in Natura 2000 Network (site PTCO0015)

# PNSAC - Natura2000 PTCON0015



Environmental protection and conservation of the Karstic landscape and associated fauna and flora.



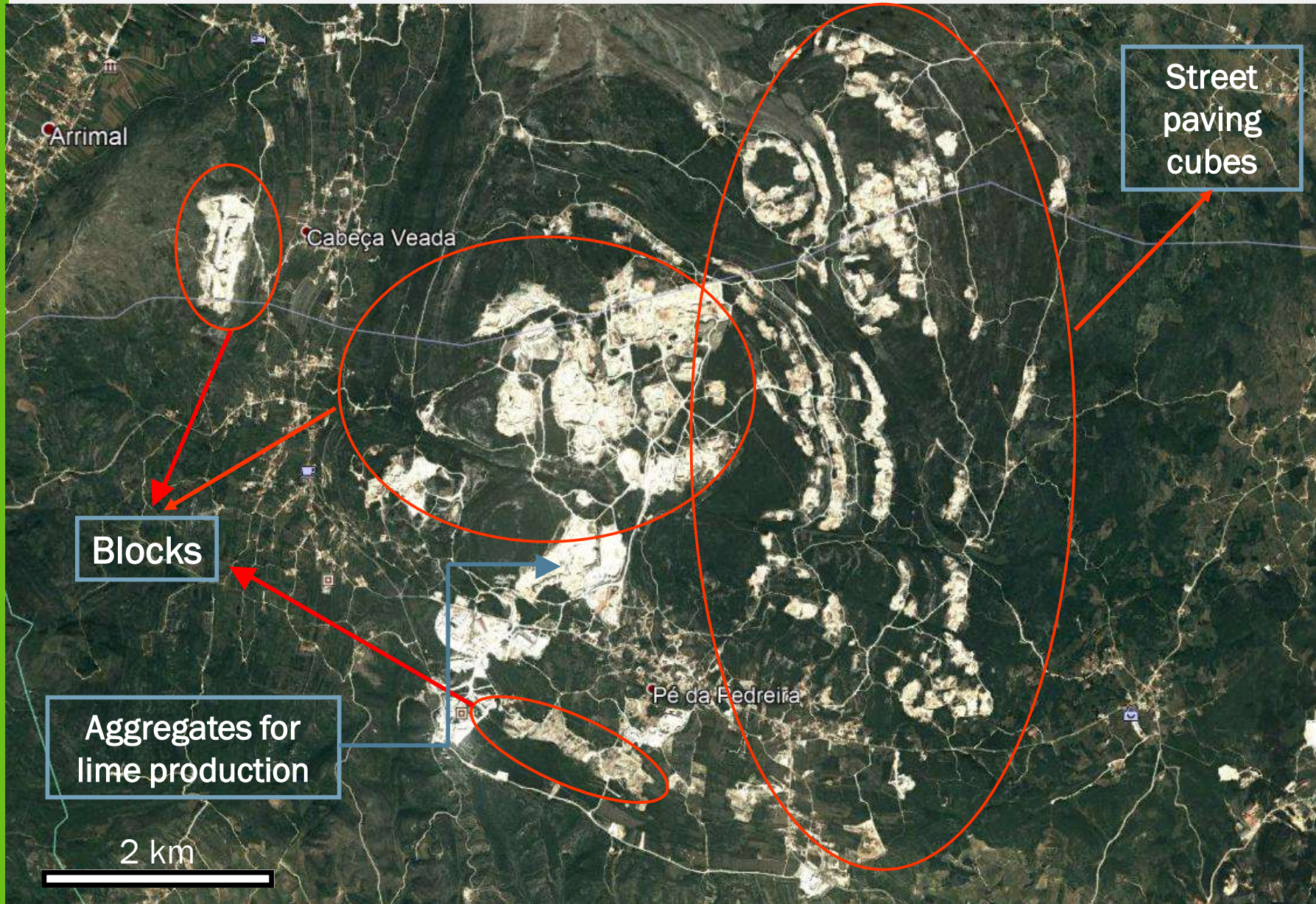
# PNSAC - Natura2000 PTCON0015 But also ...

## Human Settlements & Heritage



## Extractive industry for ornamental stones





Arrimal

Cabeça Veada

Pé da Pedreira

Blocks

Aggregates for  
lime production

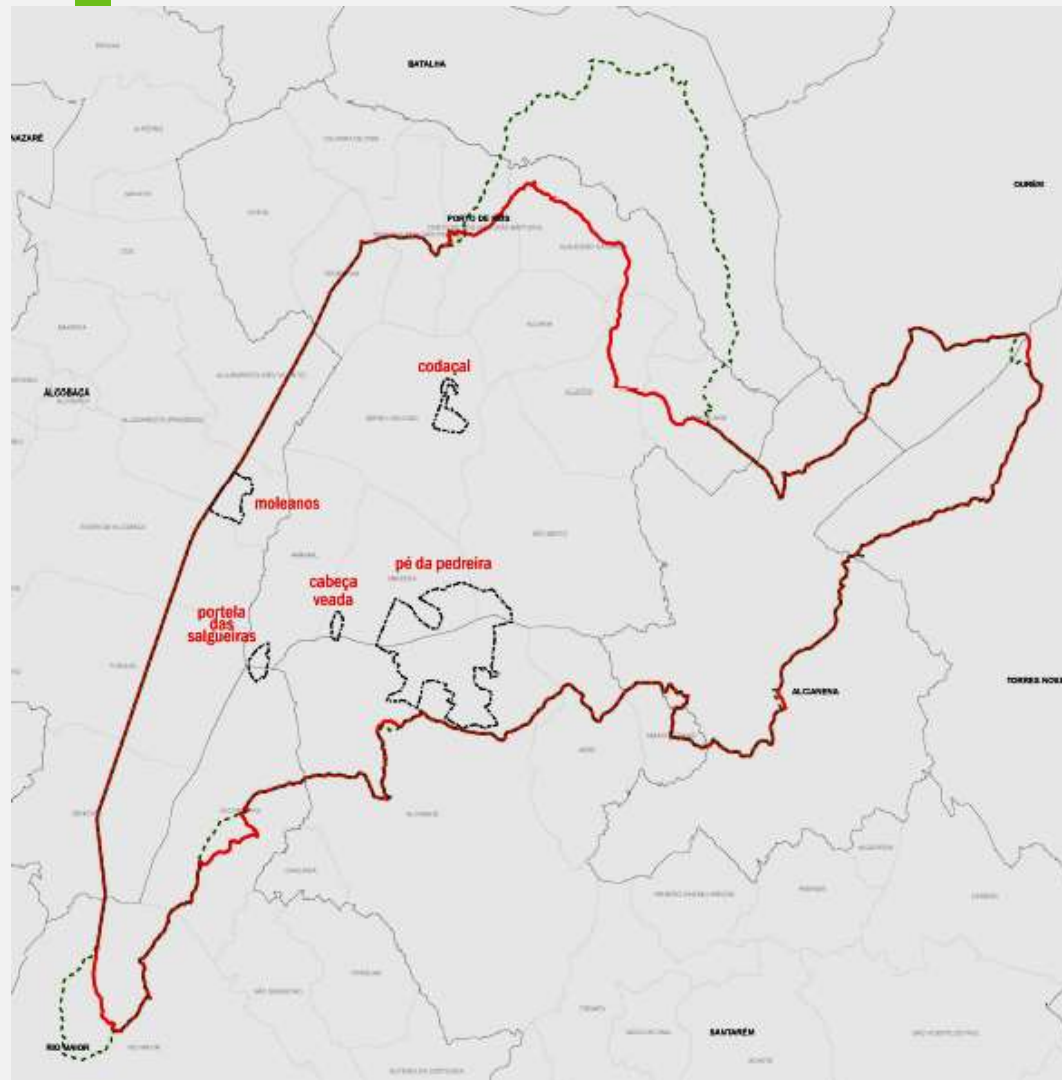
Street  
paving  
cubes

2 km

# Developments regarding the relation PNSAC/Extractive Industry

- In the mid-1980s, the industry began to grow from small operations to large operations.
  - *Large conflicts with a recently implemented PNSAC (1979), having a land-use plan not providing space for the industry grow.*
- Beginning of the 1990s: a first resources evaluation phase shows large amount of available resources.
  - *Discussions started about the need to find a compatibility between the development of the extractive industry and nature conservation.*
- Beginning of the 2000s: ASSIMAGRA starts lobbying for:
  - *An environmentally responsible extractive industry,*
  - *A land-use management plan for the PNSAC that includes specific areas for the extractive industry.*

- 2010 (almost 10 years after!): New land-use plan for PNSAC including 5 specific areas for the extractive industry of ornamental stones.
  - *Prescribing that each area should be subjected to a detailed (1:2000) Municipal Land-Use Plan*



An important and decisive goal for the inclusion of ornamental stone mineral resources in land-use planning was achieved.

# COMPLEXITY STARTS

➤ PNSAC's Land-use Plan is mostly programmatic

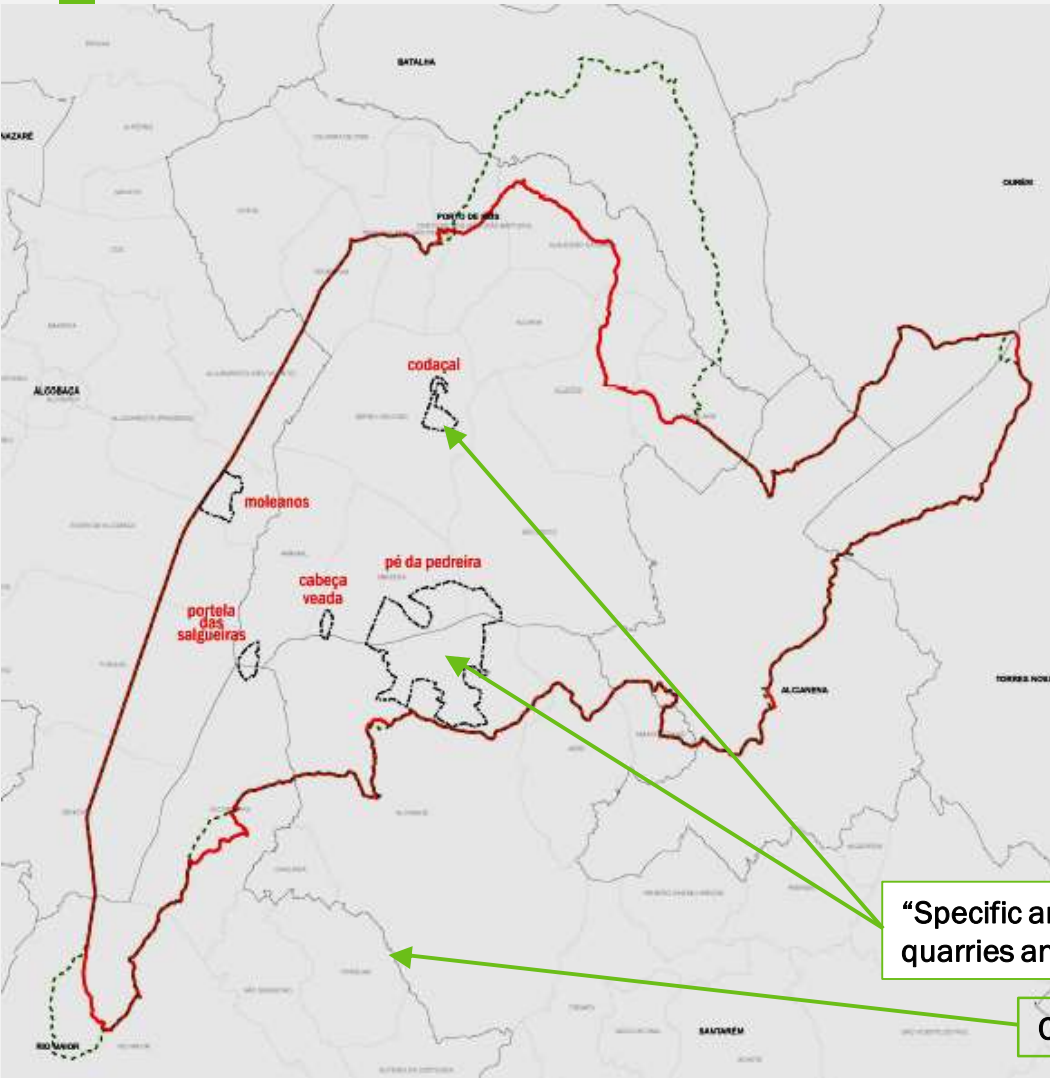
- *The effective binding land-use management is done at municipal level*

➤ Each county needs to change their municipal land-use plan according to the new PNSAC's land-use plan

- *Involving public consultations, municipal assembly approval, ... , national land-use authority approval and ministry approval*

"Specific areas" delineated on the basis of existing quarries and regional geology. Total area: ~18 km<sup>2</sup>

County administrative limits





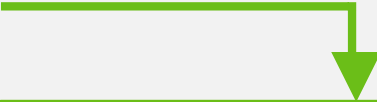
# 2011

## Project Environmental Sustainability of the Extractive Industry

- PROMOTERS:
  - *ASSIMAGRA*
  - *National Institute for the Conservation of Nature and Forests (integrating PNSAC)*
- INTEGRATED (MERGED) PROJECTS PROMOTER:
  - *DGEG (the mining authority)*
- TECHNICAL DEVELOPMENT:
  - *LNEG – Portuguese Geological Survey*
  - *PNSAC*
  - *CEVALOR (semiprivate technological centre for ornamental stones)*
  - *VISACONSULTORES (private mining engineering consulting company)*
  - *BIODESIGN (private environmental consulting company)*
- PARTNER / INVOLVED MUNICIPALITIES:
  - *Alcobaça*
  - *Porto de Mós*
  - *Rio Maior*
  - *Santarém*
- FINANCIAL SUPPORT:
  - *European Structural Funds*
  - *Ornamental stone companies from MCE*


# Municipal Land-Use Plans

- Municipal Director Plan (the main land-use and management plan)
- Urbanization Plan
- Detailed Plans
  - *Rural Intervention Plan (PIER)*
  - *Detail Urban Rehabilitation*
  - ...



The appropriate legislative tool to frame the Specific Areas for the extractive industry

SPECIFIC AREA	COUNTY	No. PIERs
Pé da Pedreira	Santarém and Porto Mós	2
Codaçal	Porto de Mós	1
Moleanos	Alcobaça	1
Cabeça Veada	Porto de Mós and Santarém	2
Salgueiras	Porto de Mós and Rio Maior	3



The project should carry out the elaboration of 8 PIERs

# PIER

## OBJECTIVE

A detailed knowledge about the territory allowing the definition of land-use categories from the perspective of the rational management of the extractive industry with the protection and conservation of the natural values

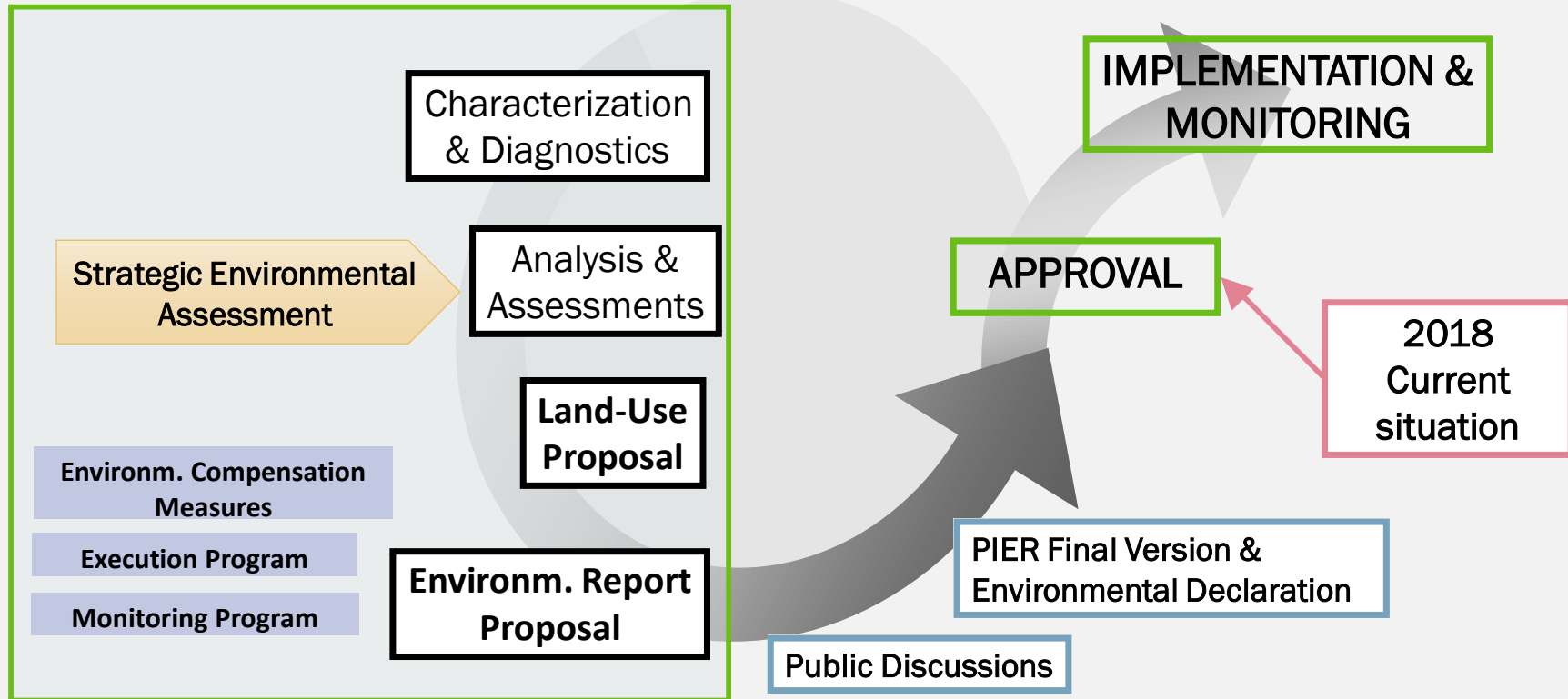
- Regulation document
- Land-Use Planning Map at 1:2.000 scale
  - *The zoning of the several land space categories*
- Existing Conditioning Map at 1:2.000 scale
  - *The easements and restrictions of public utility*
- A Report
- An Execution Program and Financing Plan
- Map of the existing situation
- Thematic Maps: Geology, Flora, Fauna, Heritage, use of the soil, ...
- Environmental Report

The main documents

The accompanying documents

# ADOPTED METHODOLOGY

## PROJECT DEVELOPMENT



## OBJECTIVE

A detailed knowledge about the territory allowing the definition of land-use categories from the perspective of

# The rational management of the extractive industry

with the protection and conservation of the natural values

- According to their nature, Portuguese mineral resources are state or private owned. Ornamental stone deposits are private owned.
- Aiming the best use of the private mineral resources the Portuguese law establishes the possibility for implementing Integrated Exploitation Projects in which each quarry must comply with the stipulated rules.

INDEPENDENT QUARRIES		NEIGHBORING OR ADJACENT QUARRIES
QUARRY No. 1	QUARRY No. 2	SEVERAL QUARRIES
1 Quarrying Plan	1 Quarrying Plan	1 Integrated Quarrying Plan <input checked="" type="checkbox"/>
1 Environmental and Landscape Recovery Plan	1 Environmental and Landscape Recovery Plan	1 Integrated Environmental and Landscape Recovery Plan <input checked="" type="checkbox"/>
1 Waste Management Plan	1 Waste Management Plan	1 Integrated Waste Management Plan <input checked="" type="checkbox"/>
1 EIA	1 EIA	1 Integrated EIA

Developed for each of the 5 Specific Areas (~100 quarries)

Approval

2018 Current situation

# SOME DEMONSTRATIVE EXAMPLES

Pé da Pedreira Area



Image © 2018 DigitalGlobe

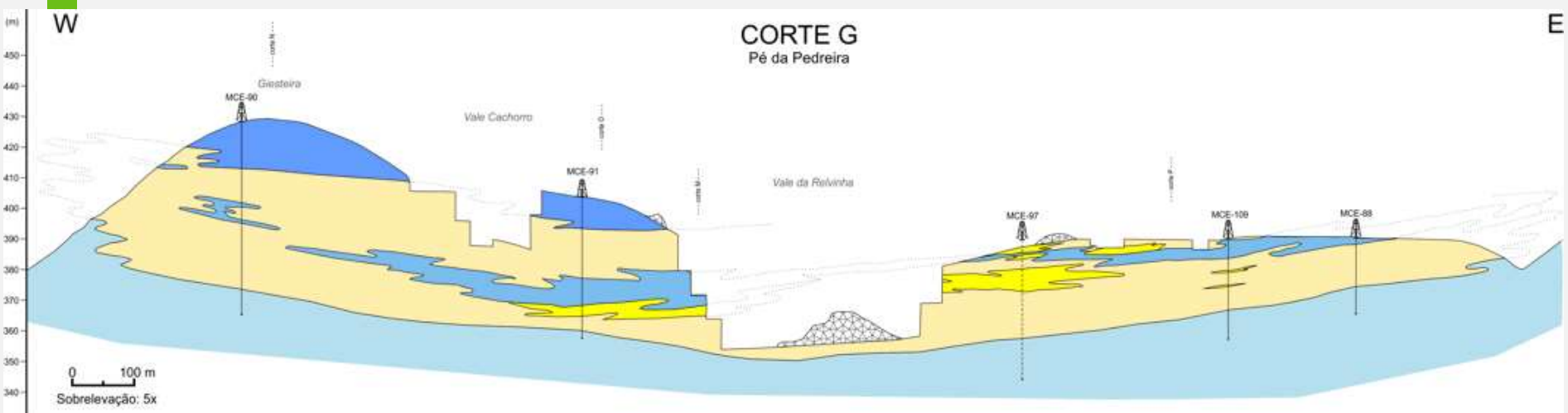
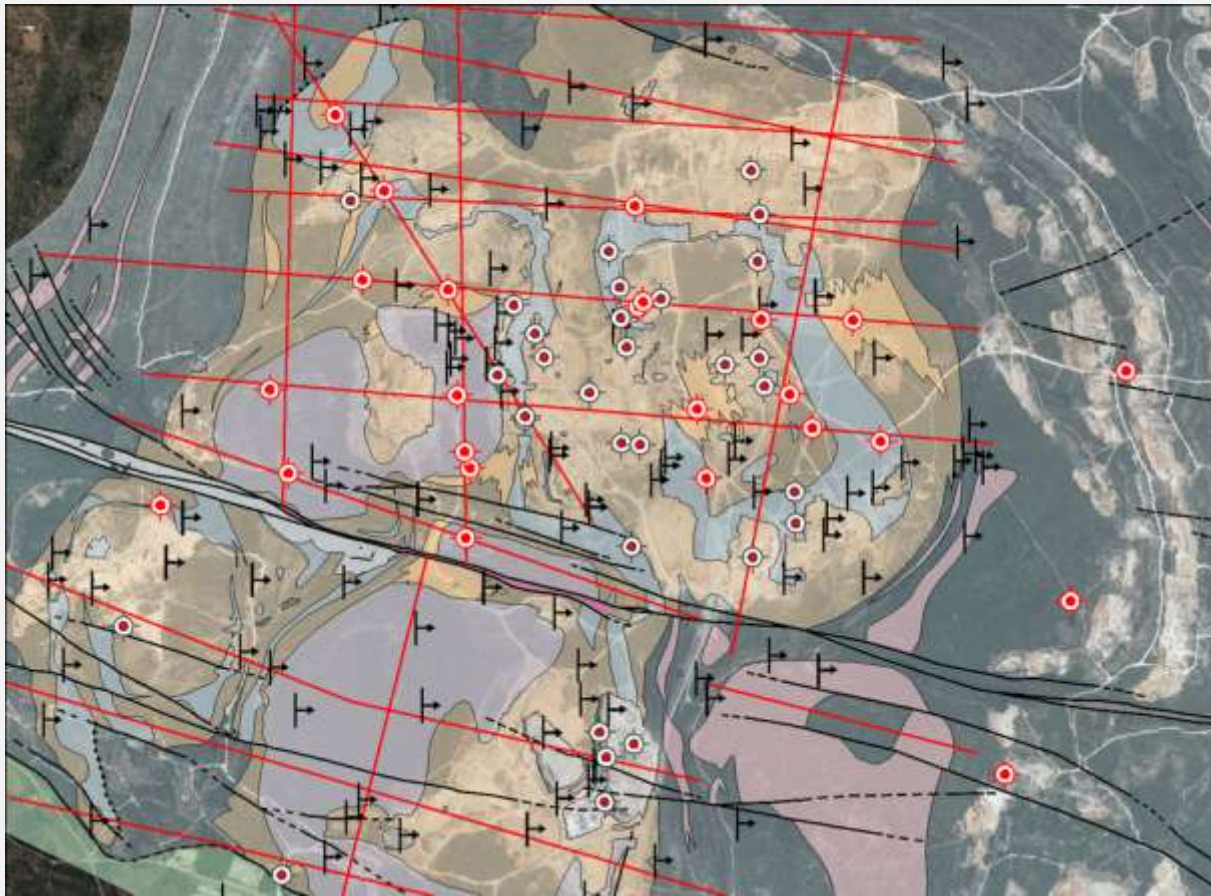
Google Earth

# Geological Field Work

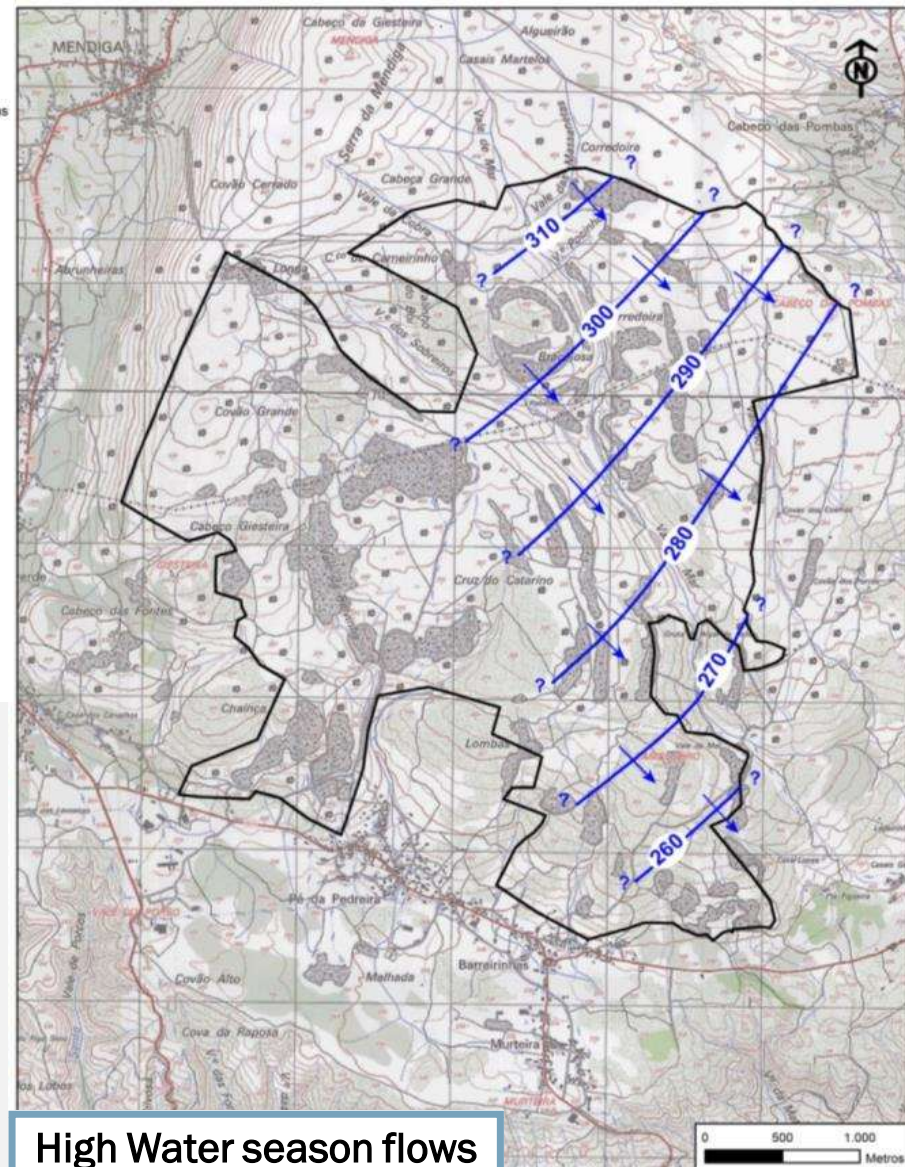
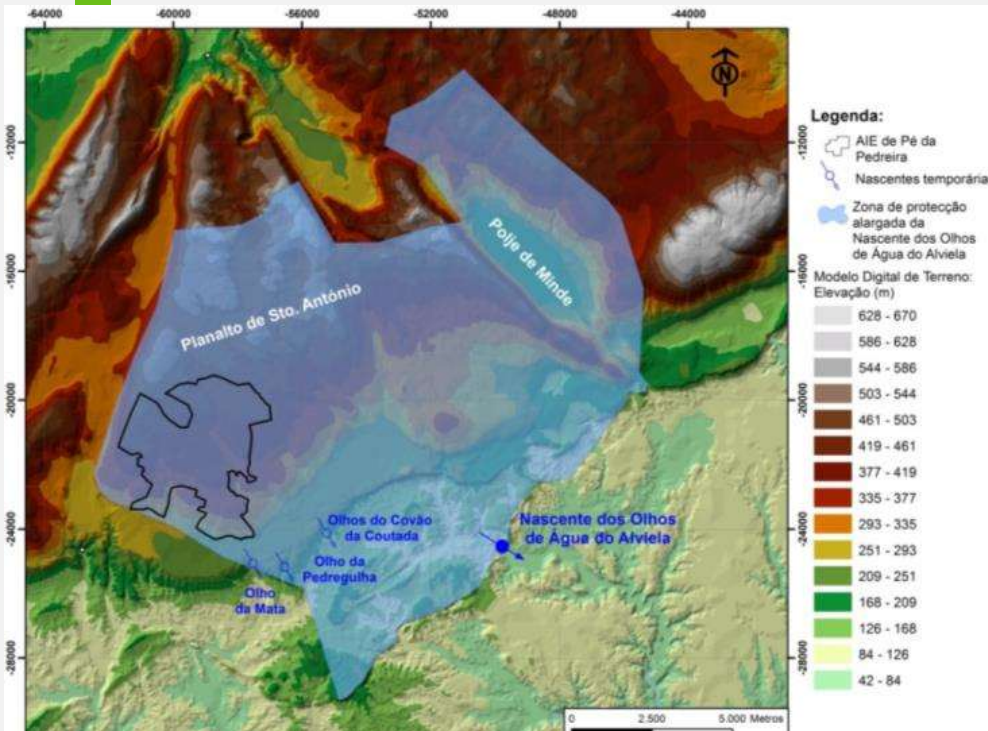










# GROUNDWATER STUDIES



High Water season flows

# GEOLOGICAL HERITAGE STUDIES & ASSESSMENT

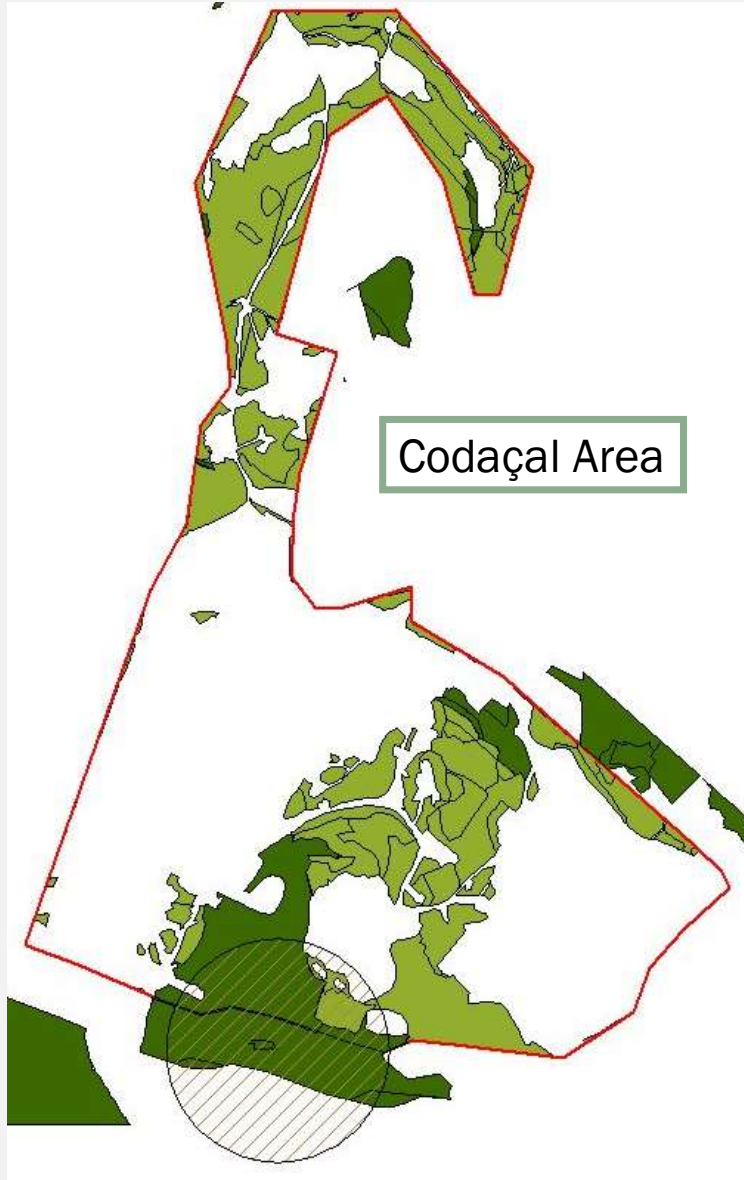
	Designação do Geossítio <b>ALGAR DA CORREDOIRA</b>		ID
			ID POPNSAC
		Data da caracterização	Agosto 2012
<b>CARACTERIZAÇÃO</b>			
<b>Localização</b>	Distrito, Concelho, Freguesia	Leiria, Porto de Mós, Mendiga	
	Localidade	Corredoira, cerca 2km a SW de Cabeço das Pombas	
	Coordenadas Geográficas	8°48'42,15"W 39°29'6,173"N	
	Carta Militar	318	
	Acessos	A partir de Cabeço das Pombas (a cerca de 8 km a NNW de Amiais de Cima) tomar a estrada asfaltada que segue para SW	
Área ocupada: -			
<b>Tipo de Valor</b>			
Geomorfológico	<input checked="" type="checkbox"/> Mineralógico	<input checked="" type="checkbox"/> Estratigráfico	<input type="checkbox"/> Mineiro
Paleontológico	<input type="checkbox"/> Petroológico	<input type="checkbox"/> Tectónico	<input type="checkbox"/> Hidrogeológico
Sedimentológico	<input type="checkbox"/> Cultural	<input type="checkbox"/> Estético	<input type="checkbox"/> Ecológico
	<input type="checkbox"/> outro		
Designação da Framework (Brilha et al., 2010) Sistemas cársicos			
<b>Caracterização geológica</b> O Algar da Corredoira apresenta um conjunto de mineralizações carbonatadas muito relevante na área do PNSAC num estado de conservação razoável. A entrada tem cerca de 1 x 0,5 m, medidas que se mantêm até aos cerca de 6 m de profundidade onde ocorre um patamar com 6 m que leva a uma sala com 9 x 10 m e a uma outra onde se encontram as singulares mineralizações. Desenvolve-se nos calcários micríticos do Jurássico Médio (Batoniano) pertencentes à formação de Serra de Aire. O algar está inserido dentro da Área de Intervenção Específica de Pé da Pedreira. Constitui um abrigo de morcegos confirmado.			
<b>Fotografias</b>			
			



Fotos BIOTA

# BIOLOGICAL ASSESSMENTS

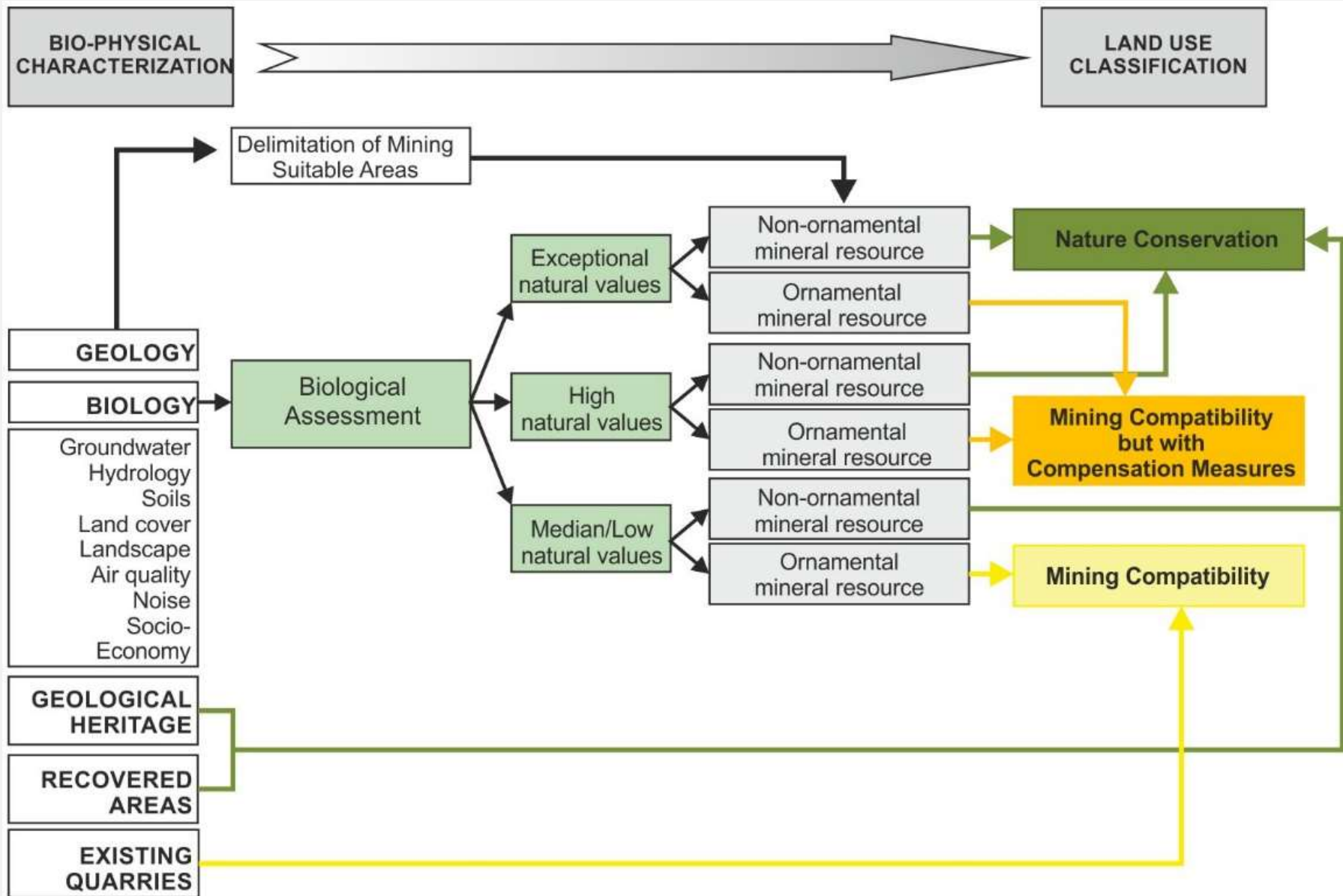
(Fauna, Flora, Habitats)






Exceptional Biological Values

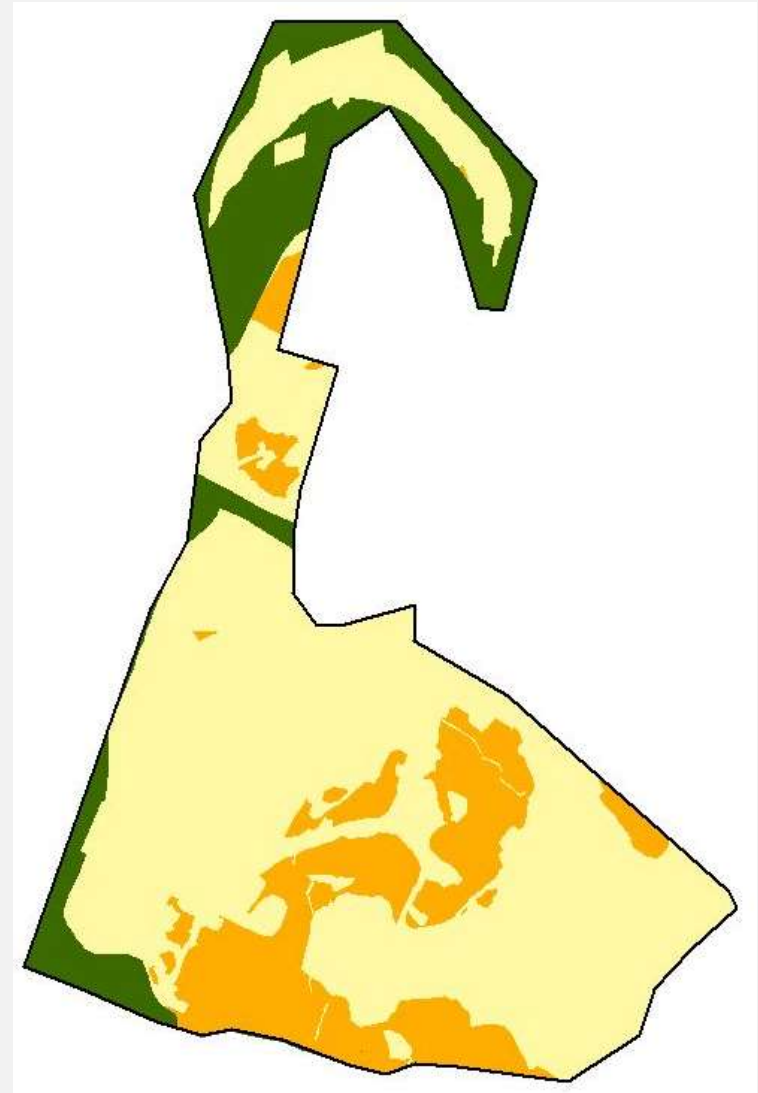
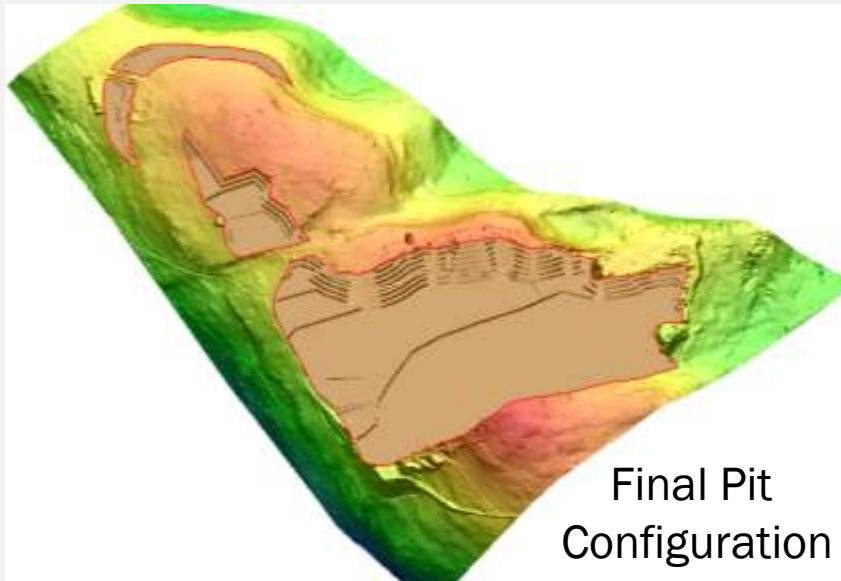
High Biological Values

# Land-Use Categorization Methodology

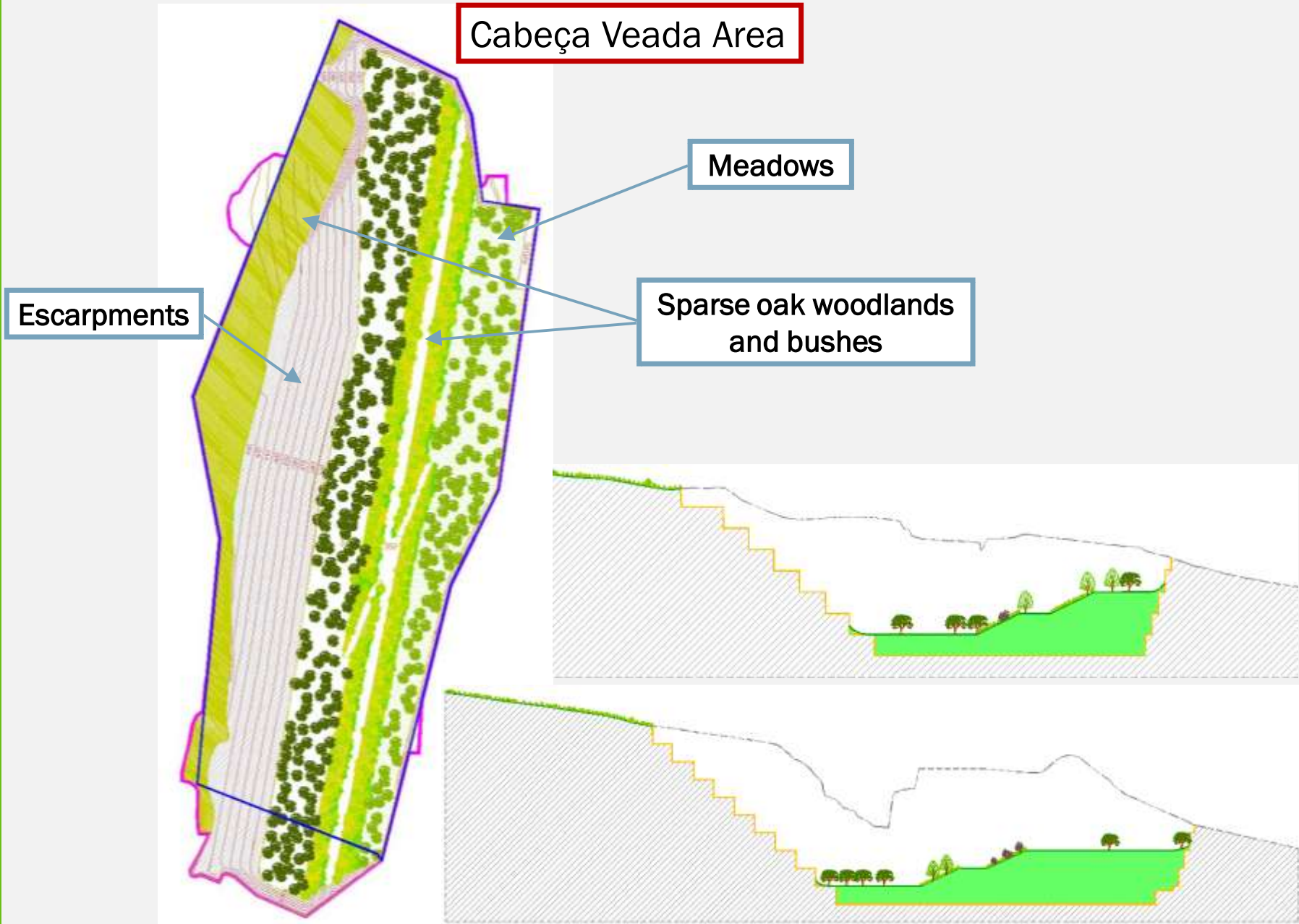


# Land-Use Proposal

- Quarrying compatibility 
- Quarrying compatibility with compensation measures 
- Nature conservation 



# Environmental and Landscape Recovery Plan



# CONCLUSIONS

- The integration of the ornamental stone resources from MCE in land-use planning is almost totally achieved
  - *The same applies for the respective extractive industry*
- It was a long-term process; not yet finished
- Complex procedure involving 3 main steps:
  - *Lobbying,*
  - *Technical development,*
  - *Normative compliance (still ongoing).*



# FOR DISCUSSION

- Is this an appropriate approach to include mineral resources in land-use planning?
- Which lessons can we obtain from this case study?
- Should the process be not so complex?
  - *Should mineral resources be integrated **a priori** in land-use planning (independently if they are located or not in nature conservation areas)?*

Thank you for your attention