Towards a database for the valorisation of tailings in mining regions.

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CURRENT STATE IN THE REGION

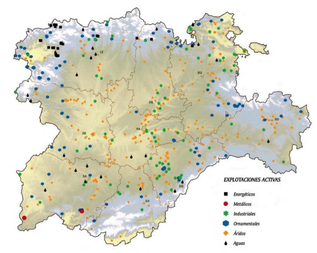


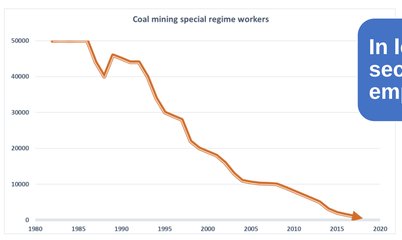
Fig. Distribution of endogenous resources in Castilla y León

- Mining has historically played a crucial role in the León province development.
- The province come to have up to **132 mines** spread throughout the entire territory of which only **15 remain active today.**
- During the last years, the sector has been subject to continous uncertainties leading to a **massive closure of mines** with their corresponding impact on **depopulation, los of employment or lack of qualified personnel.**

- The most recent European regulations point to the end of the use of coal to generate electricity.
- **Eight of the fifteen thermal power plants in Spain** are at risk of **closing in a year.**

Thermal power coal stations closing

Over two dozen coal mines have just closed down in Spain



In less than 20 years, the mining sector has suffered a decrease in employment of more than 95%

There are **26 carboniferous municipalities in the province of León** that have seen **their population reduced by 15%** in the last ten years.

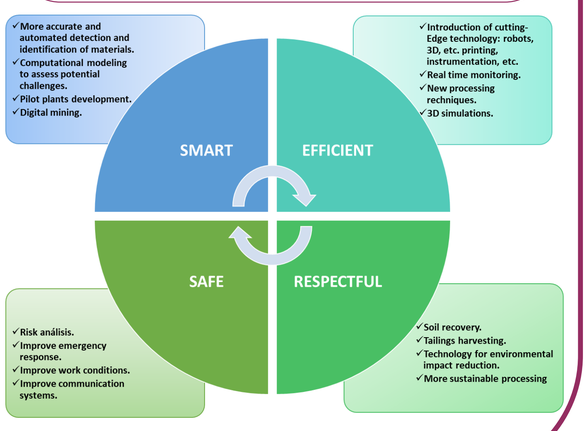
21st CENTURY SUSTAINABLE MINING

León is the biggest **coal and anthracite reserve** in Spain (1.341 million Tn).
Slate: Spain 1st worldwide market, with León covering 33% of national production.

Fig. Regional tailings with recovery possibilities. At left: La Robla coal tail. At right: Fabero anthracite tail.

Development of a new 21st century sustainable mining of low environmental impact that will occur through the improvement and integration of new methods, techniques and processes that allow maximun use and recovery of raw materials and their by-products, always in accordance with the principles of sustainability and circular economy.

The new technologies of processing and recovery of slags allow the elimination and restoration of the existing mining tails.
In this way, waste will be used by recovering those minerals with comercial interest and neutralizing other materials that could present environmental problems due to their toxicity, thus moving towards a more sustainable and environmentally friendly mining.



ICAMCyL

ICMACyL is a key player in the European strategy for the efficient management of industrial resources, energy efficiency, eco-innovation and substitution of critical raw materials with the aim of promoting the development of advanced materials from the regional network of industries and the valorization of the Castilla y León richness in raw materials, in line with its **Smart and Intelligent Specialization Strategy (RIS3).**

CURRENT ONGOING EUROPEAN PROJECTS

ISMC comprises almost **50 regional, national and international companies** joining efforts to consolidate the strengths of the **mining sector and its associated services** and to promote sustained economic growth, giving priority and special attention to **SMEs.**

CORE CAPACITIES

The cluster **covers the entire mining value chain** from the extraction of mineral resources or mining engineering to training, transportation, trading and associated servicesIn addition, the Cluster **covers a wide range of raw materials and critical raw materials (CRMs).**

IMPACT

78% SMEs 1,173 jobs

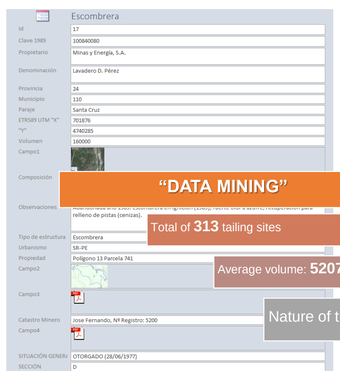
460 M€ of turnover

0,038% of Spain's GDP

METHODOLOGY-TAILING DATABASE

1. First exploratory review

Selection of those tailings with the highest technological and economic interest.



MAIN PARAMETERS

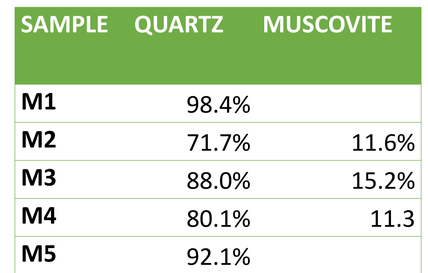
- Owner
- Location
- Volume
- Nature of substrate
- Type of tailing and lithology
- Type of structure

2. Data selection

Data of interest:
- Geographical data: Volume; Nature of the substrate; Type of residue and lithology; Type of structure; Observations.
- Administrative data: Owner; Appellation; Cadastral information.
- Cadastral mining data: Province; Municipality; Landscape; Coordinates (already transformed ino ETRS 89).

3. Results

RMIS is the online knowledge platform for the European Commission on non-agricultural and non-combustible raw materials, coming from primary and secondary sources.
The results obtained will be introduced in the RMIS **"Raw Materials Knowledge Gateway".**



LOOKING FOR STRATEGIC AND CRITICAL RAW MATERIALS

Thanks to the support of the regional government, ICAMCyL Foundation is analyzing the samples obtained from the tailings in order to confirm the existence of a high potential for the valuation of the resources derived from the mining activity in León province.

METHODOLOGY:

1 SAMPLE PREPARATION

Work order that includes: sample labeling, degree of alteration, location and date.
Sample cleaning in order to remove contaminants.

2 COMMINUTION PROCESS

For the grinding the jaw crusher and secondary ball mill will be used.
The sample is crushed to a size of **7 cm** and cleaned to remove any desintegrated material attached to the sample of interest.

3 SIEVING PROCESS

- A direct classification is carried out by sieving screening.
- As the particle size decreases, the efficiency is lost in the process. **This makes it to operate with sizes larger tan 250 microns.**

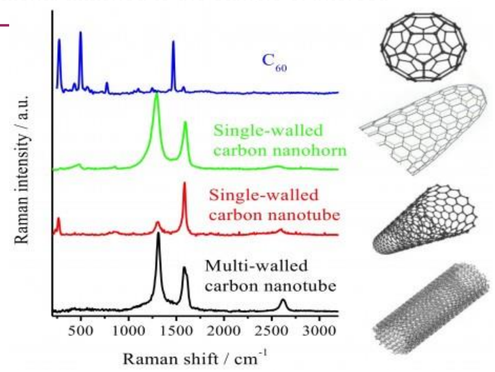
4 FIRST RESULTS

M3: particle sizes between 4 and 5 mm
M4: particle sizes between 2,3 and 4 mm
The samples are mainly composed of quartz with secondary proportions of muscovite.

SAMPLE	QUARTZ	MUSCOVITE
M1	98.4%	
M2	71.7%	11.6%
M3	88.0%	15.2%
M4	80.1%	11.3
M5	92.1%	

5 RAMAN SPECTROSCOPY

RAMAN spectroscopy is a very powerful technique in the identification and characterization of all carbon members, which is characterized by **being fast**, **non-destructive**, having **high resolution** and providing a large amount of **structural and electronic information.**



From the **Raman spectrum**, it is possible to differentiate between **graphite, monolayer graphene, bilayer graphene, graphene with few layers and amorphous graphene.**

Many of the structures present in the **Raman spectrum** of graphene are also present in graphite and nanotubes, so that the compression of all structures present in the **Raman spectrum** is key to elucidating the properties of the different allotropic forms of carbon .

The **objective** of RAMAN spectroscopy is to analyze the samples obtained in the ***first results*** and **compare their spectra to assess the potential uses** of the materials present in the previously selected tailings.

ACKNOWLEDGMENTS

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