

# Lithium opportunities Portugal

## National Lithium Strategy

### Potentialities

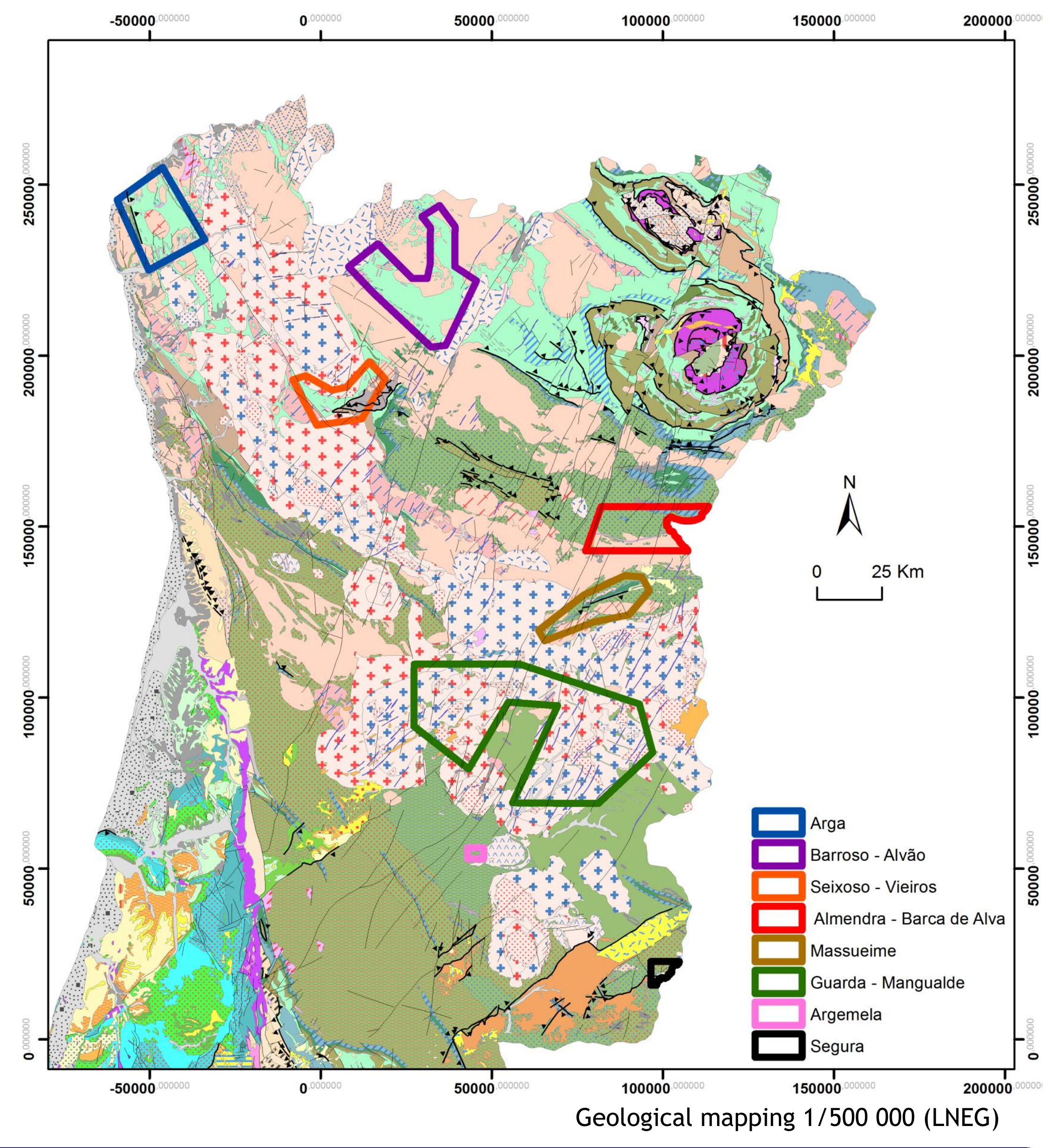
- Portugal has strong mineral potential to host extensive lithiferous thick aplite-pegmatite dikes and veins swarms or greisen systems;
- The resources have been exploited together with the feldspars for the ceramic and paints industries;
- The acceleration of electrical mobility and communications technologies and the search for more efficient energy storage mechanisms can enhance their use for other applications.

### Integrated strategy involving the entire range

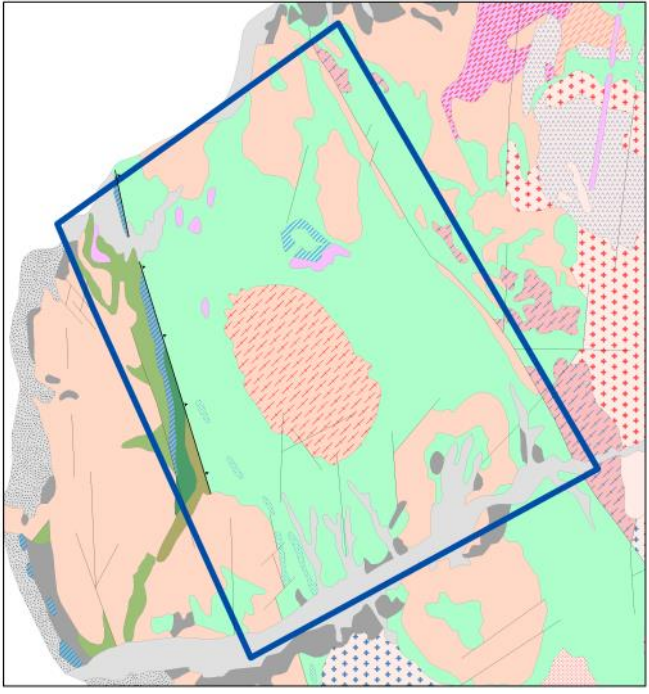
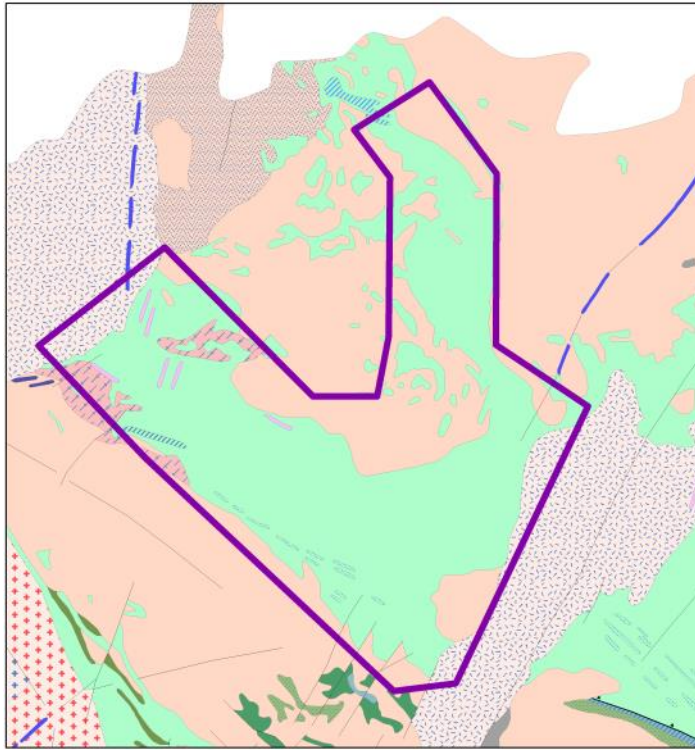
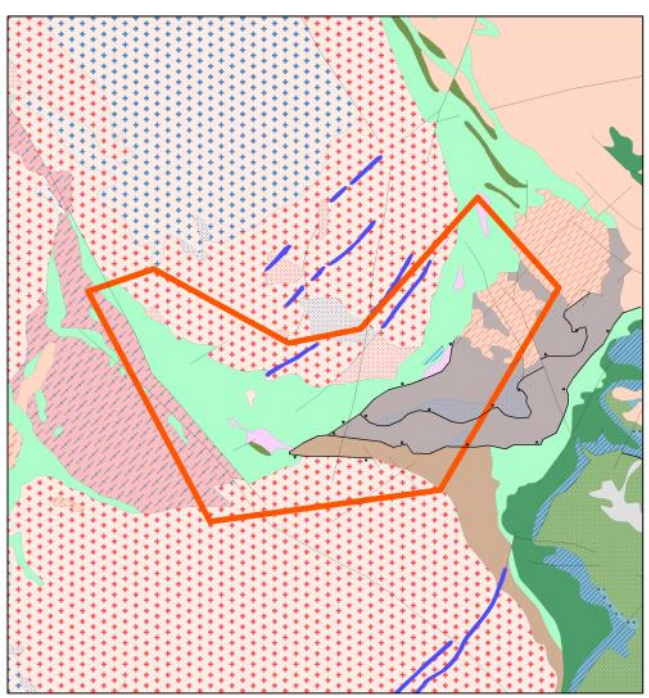
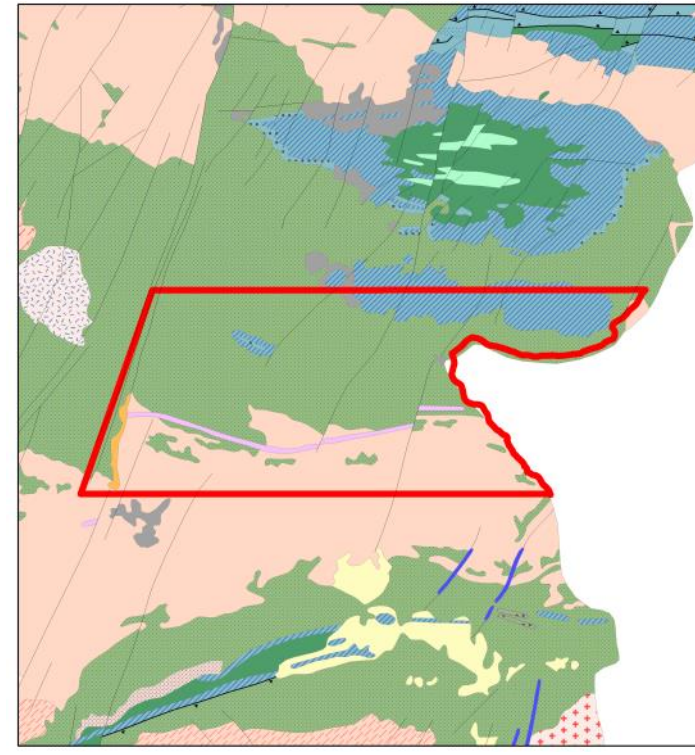
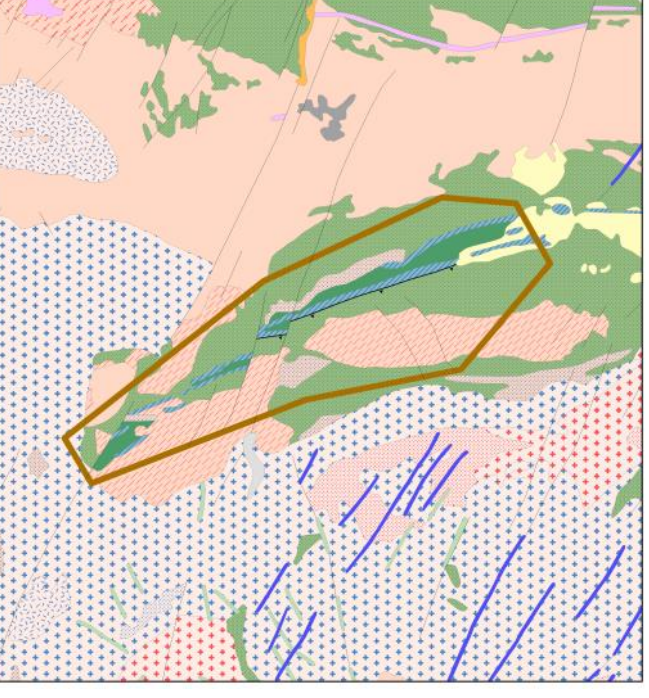
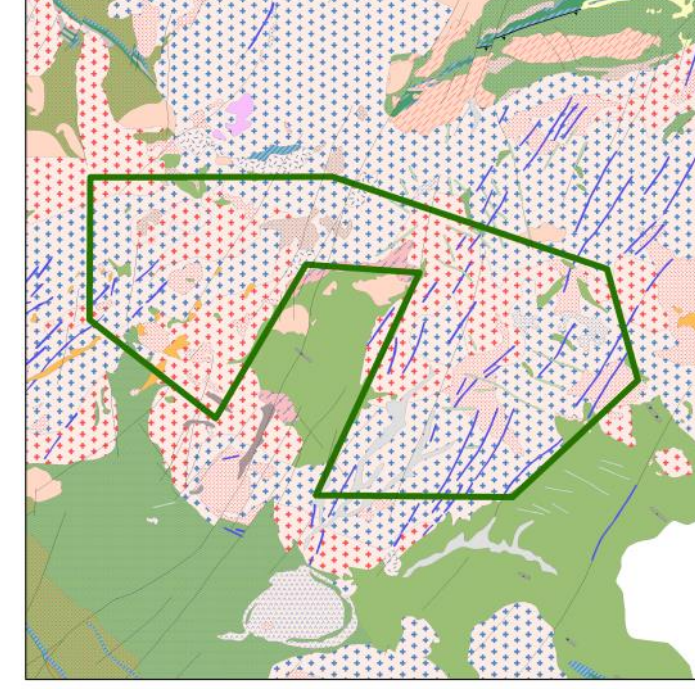
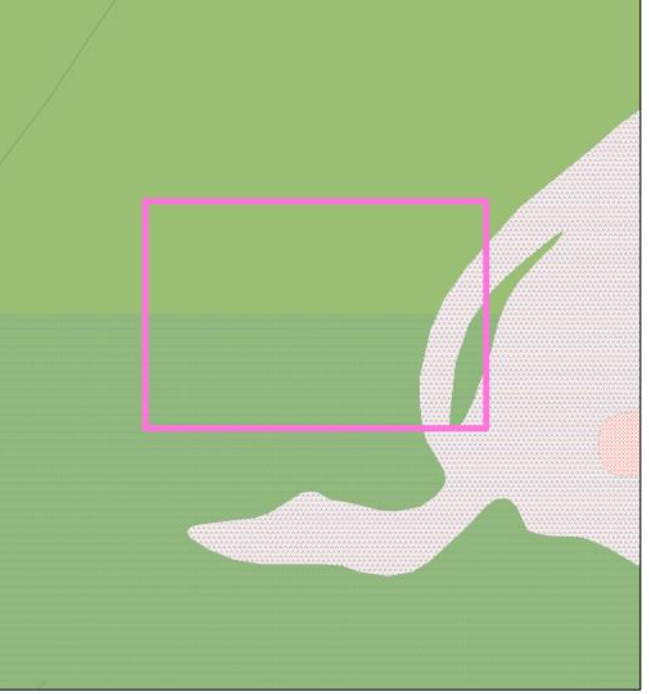
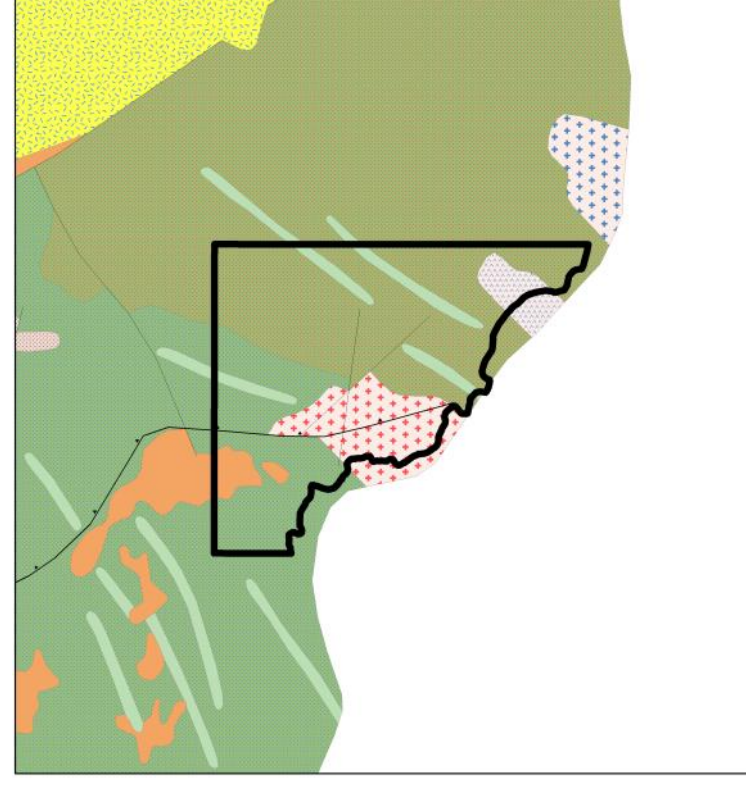
- The existence of user industries in Portugal enhances the opportunity to create a new industrial sector from extractive activity to the production of batteries, due to the proximity economies it may provide;
- There is a consolidated research on the technological processing in the beneficiation of lithium minerals in their main types of occurrences: lepidolite, spodumene and ambligonite;
- It is essential to stimulate the "cooperation" of companies in order to evaluate and install technological units to increase the added value of these products;
- Promote the integration of environmental concerns and efficient use of mineral resources, aiming at "zero waste" in the lithium recovery process;
- Promote the principles of circular economy by encouraging the recycling of lithium from used batteries.

### More competitive and more transparent access to the activity

- Portugal has a stable legal framework, adequate institutional support, excellent infrastructures and high scientific and technological know-how that confers advantages on investment in the lithium sector;
- Granting of exploration areas through open public tenders that promote the interest of multinational players with demonstrated technical and financial capacities.



## Li Potential Areas — Public Tender

<p><b>Serra de Arga Aplitic-Pegmatitic Field</b></p> <ul style="list-style-type: none"> <li>Area: 409 km<sup>2</sup></li> <li>Exo-granitic aplitite-pegmatites</li> <li>LCT type</li> <li>Pegmatites with petalite and/or spodumene and aplites with disseminated ambligonite-montebbrasite</li> <li>Petalite (ceramics) &gt; 22 000 ton @ max. 1.3% Li<sub>2</sub>O (Formigoso)</li> <li>Spodumene (Probable resources) &gt; 2 500 ton @ max. 1.9% Li<sub>2</sub>O (Affife)</li> </ul> 	<p><b>Barroso-Alvão Aplitic-Pegmatitic Field</b></p> <ul style="list-style-type: none"> <li>Area: 647 km<sup>2</sup></li> <li>Rare elements pegmatites; LCT complex-type, spodumene, petalite and lepidolite sub-types</li> <li>Spodumene aplitite-pegmatites: 0.78% Li<sub>2</sub>O</li> <li>Petalite aplitite-pegmatites: 1.30% Li<sub>2</sub>O</li> <li>Lepidolite aplitite-pegmatites: 0.77% Li<sub>2</sub>O</li> <li>Inferred Resources: 14 millions tons @ 1% Li<sub>2</sub>O (average grade)</li> </ul> 
<p><b>Seixoso—Vieiros region</b></p> <ul style="list-style-type: none"> <li>Area: 256 km<sup>2</sup></li> <li>Rare elements pegmatites, LCT complex-type, petalite sub-type</li> <li>Seixoso aplitite-pegmatites: ambligonite-montebbrasite, petalite</li> <li>Vieiros aplitite-pegmatites: spodumene, petalite (ambligonite-montebbrasite)</li> <li>Resources estimation: not available</li> </ul> 	<p><b>Almendra—Barca de Alva region</b></p> <ul style="list-style-type: none"> <li>Area: 343 km<sup>2</sup></li> <li>Rare elements pegmatites; LCT complex-type, lepidolite sub-type</li> <li>Lithiferous pegmatites: 0.42—0.52% Li and 0.05%Sn (Barca de Alva mine); 0.5% Li and 0.07% Sn (Feli mine)</li> <li>Aplitic-pegmatitic veins: 0.16% Li and 0.05% Sn (Pombal)</li> </ul> 
<p><b>Massueime region</b></p> <ul style="list-style-type: none"> <li>Area: 258 km<sup>2</sup></li> <li>Pegmatitic dykes: ambligonite and lepidolite</li> <li>Granulitic or pegmatitic veins: ambligonite rare</li> <li>Massueime deposit: &lt;150 tons Li<sub>2</sub>O; &lt;1500 tons Sn and ambligonite &gt; 500kg</li> </ul> 	<p><b>Guarda—Mangualde Aplitic-Pegmatitic Fields</b></p> <ul style="list-style-type: none"> <li>Area: 1725 km<sup>2</sup></li> <li>LCT complex-type pegmatite, lepidolite and petalite sub-type</li> <li>Measured Mineral Resources : 1 400 000 tons @ 0.42% Li<sub>2</sub>O (Seixo Amarello—Gonçalo)</li> </ul> 
<p><b>Argemela region</b></p> <ul style="list-style-type: none"> <li>Area: 15 km<sup>2</sup></li> <li>Ambligonite-montebbrasite: hydrothermal deposits related with granites (Mina da Argemela)</li> <li>Lepidolite and Ambligonite-montebbrasite: microgranite modified by pegmatoids fluids (Cabeço da Argemela)</li> <li>Inferred Mineral Resource: 20.1 million tons @ 0.4% Li<sub>2</sub>O</li> </ul> 	<p><b>Segura region</b></p> <ul style="list-style-type: none"> <li>Area: 34 km<sup>2</sup></li> <li>LCT complex-type with rare metals, lepidolite sub-type</li> <li>Exo-granitic aplitite-pegmatite veins</li> </ul> 

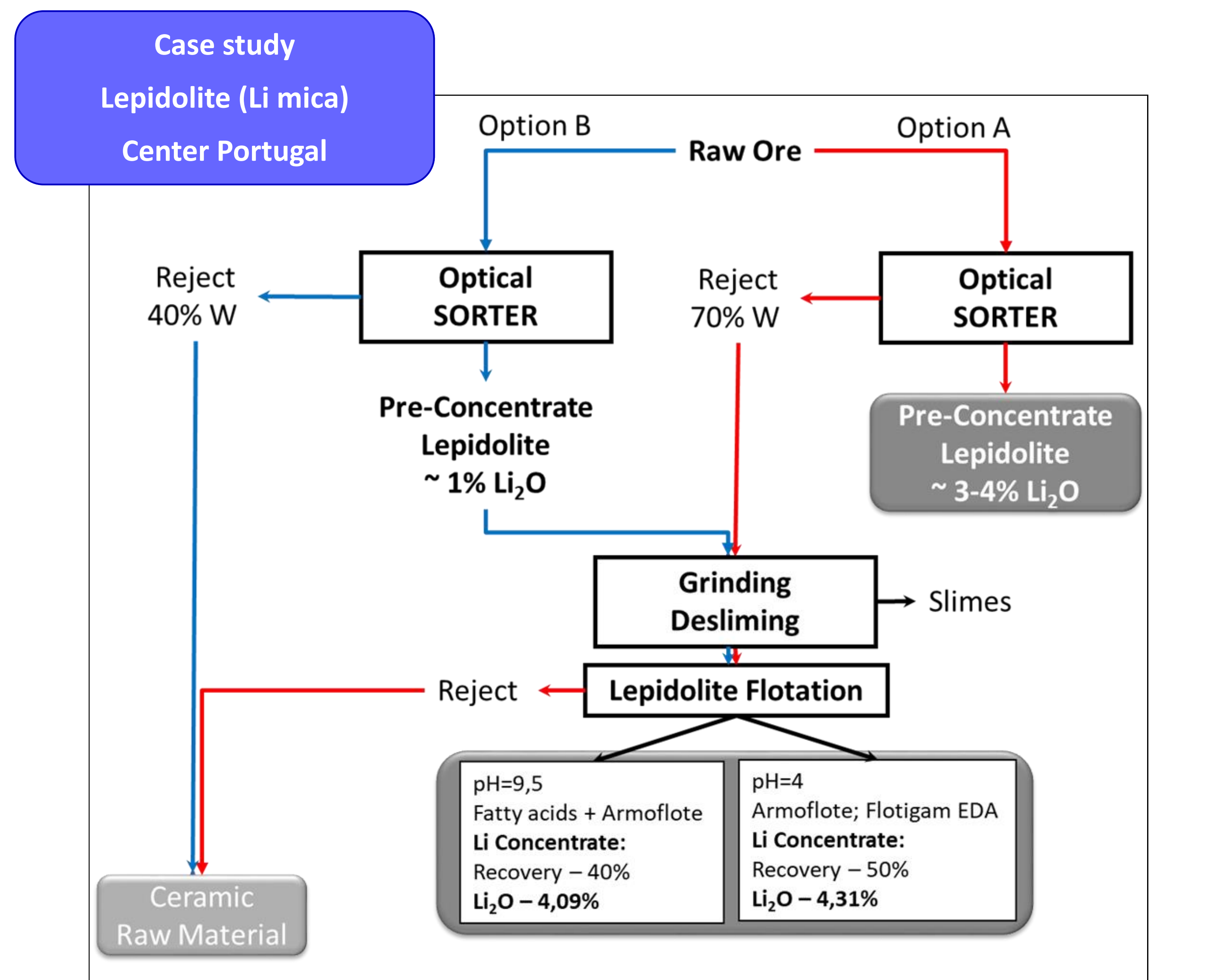
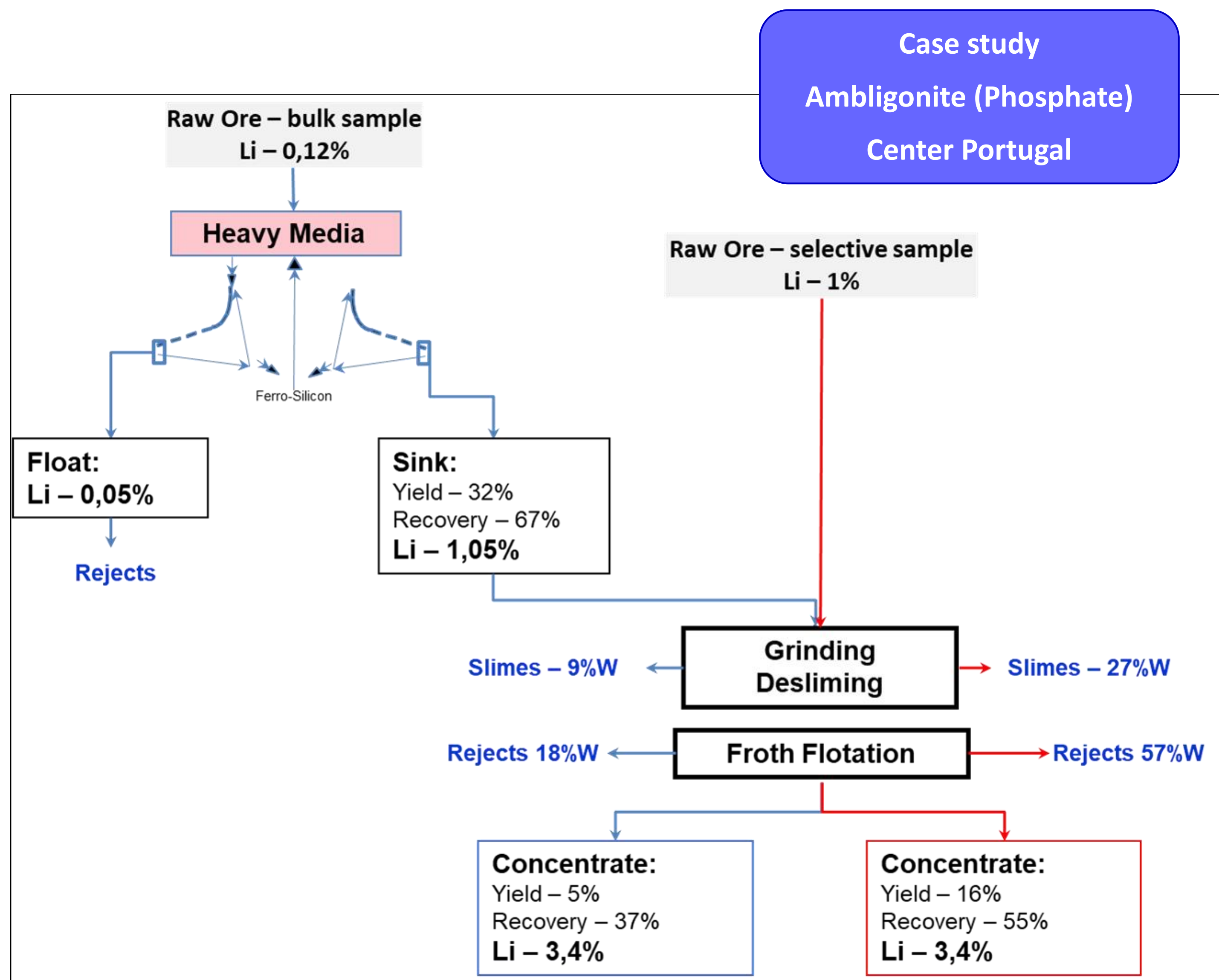
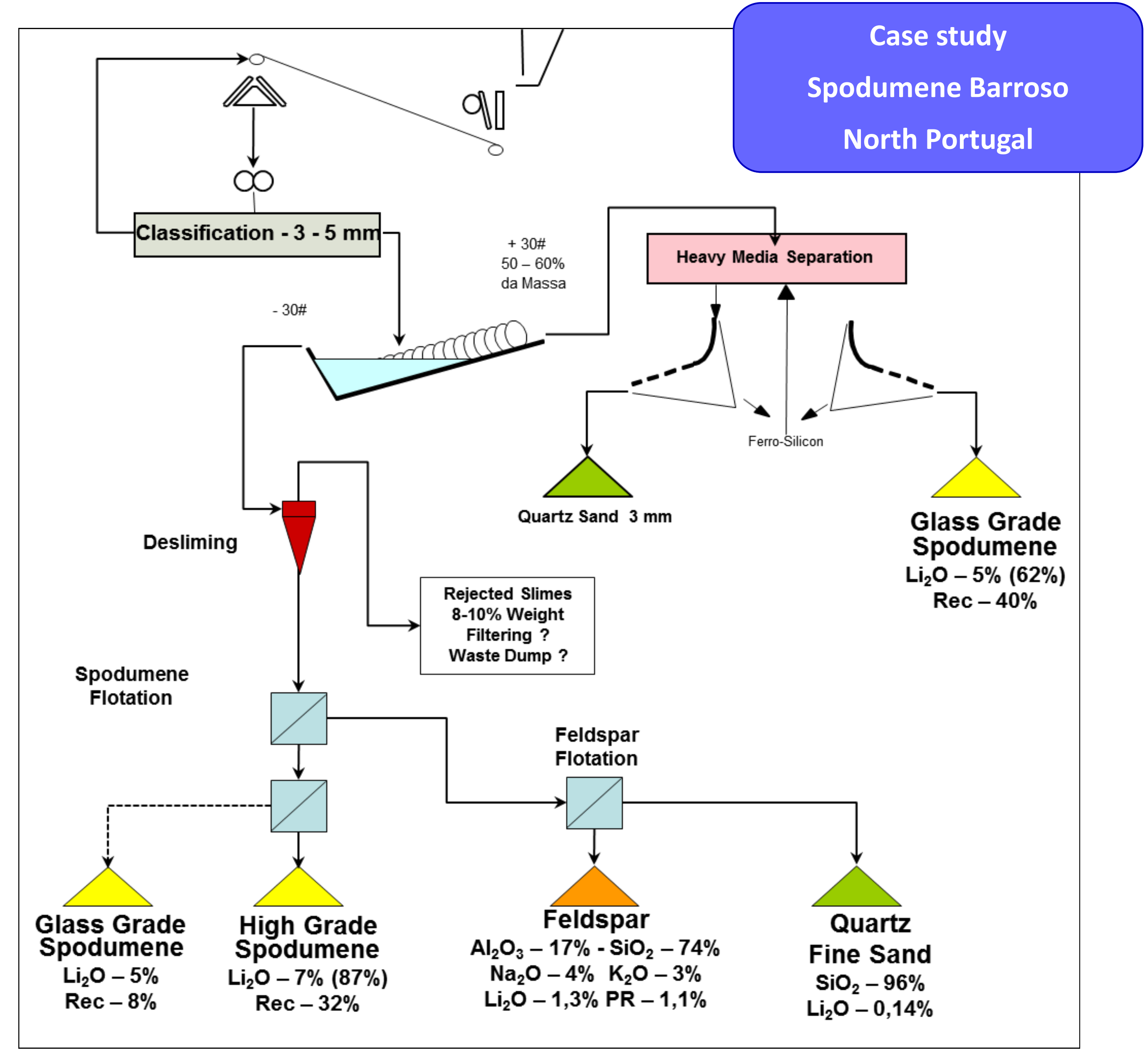
## Technical feasibility for the production of Concentrates of Li-Minerals in Portugal

**TECHNOLOGICAL PROCESSING is needed for beneficiation of Li Minerals**

Techniques that take advantage of the contrast of properties exhibited by different Li minerals and by the associate gangue minerals, such as *specific gravity*, *floatability* and *optical properties* can be applied to upgrade Li concentrates:

- Heavy Media Separation and Optical Sorting can be used in roughing stages, in order to produce "pre-concentrates"
- Froth Flotation – is referred to as the processing technology that is capable of producing **High Purity Li Minerals Concentrates**

The Portuguese main Li Ores (lepidolite, spodumene, ambligonite) have been investigated for years in order to study the application of those mineral processing techniques.



## Tender

**Deadline: 1st semester 2018**

**Conditions: www.edm.pt**