Universidade do Minho

The Mina do Barroso Project
Economic and Development Impacts

A study conducted for:

SAVANNAH

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Disclaimer: The data related to the project, which were used to calibrate the impacts, were provided by Savannah Resources plc. The consulting team treated them without questioning their veracity and correctness.

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Chapter I. Introduction

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1.1. Study framework

Lithium-ion batteries are centrally positioned in the new energy paradigm, based on renewable energies. The consolidation of a low-carbon economy requires strengthening the weight of the share of renewable energy generation in the energy mix and the widespread use of these energies, in particular for mobility purposes.

Since the beginning of the 2000s, the importance of lithium-ion batteries has grown significantly due to their incorporation into all types of electronic and electrical appliances. However, the great leap in terms of importance is produced in the last decade with its massive incorporation into private and collective electric vehicles[1].

Currently, European battery production accounts for only 3% of the global total. Asia, with 85% of the market, and the United States dominate global production. Recently, the European Union, in order to break its dependence on an area crucial to its security and competitiveness, has streamlined a number of initiatives involving public and private entities. Of these, the most relevant for its scope and ambition is the so-called European Alliance for Batteries, which has as its main purpose to build in Europe an ecosystem that encompasses the entire value chain of battery production: mining and processing, battery materials, cell production and battery production systems batteries, as well as their use and recycling.

The European dependence on raw materials to feed the battery value chain is even more significant. Of the main component, lithium, in Europe are only produced 800t annually, all of them in Portugal. Interestingly, this production is intended for the manufacture of ceramics and not for the manufacture of battery cells.

The largest known reserves of lithium in European territory are in Portugal. Although the country's 60,000t of existing reserves (0.4% of world reserves) are insufficient to meet the demand for lithium derivatives for battery production in Europe, they are very relevant to reduce their dependence on other regions of the globe and to increase the security of their supply chain.

For these methods, exploration projects on lithium-cesium-tantalum (LCT) pegmatite exploration projects in Europe are strategic in character and should be supported by all administrations involved. In Portugal, the project that is currently at a more advanced stage in terms of licensing is that of Mina do Barroso in the municipality of Boticas, promoted by *Savannah Lithium, Lda*. Despite the support of the Portuguese government, this project has faced some resistance at the local level, largely due to misinformation and poor management of prospecting and licensing processes in similar projects elsewhere in the country.

In addition to the strategic importance of the project at European level, its strategic relevance to Portugal is indisputable. The exploitation of LCT pegmatites from the Mina do Barroso project and the corresponding production of concentrate puts the country in a privileged position to activate activities downstream of the battery value chain and even the value chain

[1] The importance of lithium-ion batteries was recognized in 2019 with the awarding of the Nobel Prize in Chemistry to their creators – one American and one British inventor, affiliated with American universities, and a Japanese, affiliated with a Japanese university.

of the new extended electrical mobility. These include the construction of a refinery for the production of lithium derivatives[2], the construction of a factory for cells and battery systems and, potentially, the location of an electric car production plant or small production plants of other vehicles such as motorcycles, bicycles or scooters, among others.

The realisation of these investments would have a very significant multiplier effect on the Portuguese economy, which would considerably increase the national added value associated with these branches of activity. Regardless of the investments that can be mobilised downstream in the value chain, the Mina do Barroso project itself will have a not insignificant impact, for its contribution to GDP formation and the increase in Portuguese exports.

The economic impacts of the project at local level are potentially also very significant, particularly in terms of generating additional activity and creating jobs. In order to maximise these impacts locally, measures need to be taken at local level to prevent the positive effects of the project, which can offset negative ones (especially environmental ones), from being exported to other territories through overflowing effects. Doubts about the economic impacts of the project and reservations about its environmental impacts should be addressed in the Social License to Operate to be granted by the promoting company. This social license, which is closely related to intangible and coexistence aspects between the company and the host community, is, in general, in the context of extractive industries, much more important than formal prospecting, exploration and operation licenses. To guarantee the Social License to Operate and also within the scope of its Corporate Social Responsibility, the company promoting the project is available to ensure the smooth functioning of the benefit sharing mechanisms and to contribute financially to a Community Development Fund that finances several programs focused on local community.

The company hired the University of Minho to carry out an independent study on the economic impacts of the project and its context in the national and local economies, and even in the European economy. The ultimate objective of this initiative is to present, in a reasoned way, to governments, especially the local, public policy makers and the local community, the economic consequences of the project, the ways in which these impacts are appropriated and the benefit sharing models, which can be the object of future implementation, based on the best international practices in this matter.

The main objectives of the study are: i) To measure the economic impacts of the Mina do Barroso project in the short term and to advance some of the impacts that may result from the project in longer terms; and, (ii) show the relevance of the project from an economic point of view for

[2] Combining the concentrate produced at the Mina do Barroso project with imported concentrate to ensure a sufficiently efficient production scale.

Europe, Portugal and the Barroso region, notably for the municipality of Boticas.

Other objectives of the study are:

i. Discuss the relevance of lithium to certain sectors of the economy, especially for the mobility sector, in particular for the manufacture of batteries;
ii. Briefly present the Mina do Barroso project;
iii. Explain the European strategy for the battery value chain and present the main initiatives currently under development in Europe;
iv. Identify the main types of impacts of the project on the Portuguese economy;
v. Analyse the links between extractive industry and territorial development, sustainable development and economic development
vi. Review and analyse the main drivers and mechanisms of benefit sharing, especially in developed countries;
vii. To present ways of implementing benefit sharing, paying particular attention to Community Development Funds;
viii. To carry out a territorial diagnosis of the Barroso region and more specifically the municipality of Boticas;
ix. Review key references to mineral resources and extractive industries in application planning instruments, both at national and regional and sub-regional level;
x. Develop a proposal for a territorial strategy for the municipality of Boticas;
xi. Propose mechanisms and programs for sharing benefits for the municipality of Boticas;
xii. Make a set of recommendations for the different *stakeholders* involved in the project.

The implementation of the Mina do Barroso project would have very significant impacts on the Portuguese economy. It is estimated that the country's Gross Output would increase by 168 million euros in the investment phase and around 90 million euros per year in the operation phase. The project's contribution to GDP would be EUR 65 million in the investment phase and almost EUR 34 million per year in the operational phase. The impact on employment would be 2,800 jobs (equivalent annual employment) in the investment phase, and almost 1,500 in the operation phase. The annual impact of the project on exports during the operation phase would exceed EUR 110 million.

The rest of the document is organized as follows. The following sections of Chapter I are dedicated to discussing the relevance of lithium, presenting the Mina do Barroso project and analyzing the importance of the project for Europe and Portugal, exposing the strategy for the value chain of batteries in Europe and the intentions of the Portuguese government in this area. Chapter II discusses the relations between extractive and development industries and the activators, models and strategies for implementing the sharing of benefits derived from extractive projects. Chapter III conducts a macroeconomic impact mediation exercise, based on the input-output methodology. In the first part of Chapter IV, a diagnosis of the territorial context in which the project is presented and a survey of the paper that the documents

planning in Portugal reserve geological and mineral resources and extractive industries. The second part of the chapter, which has an eminently propositional character, presents a territorial development strategy for the Boticas project, which reconciles the valorization of its endogenous resources and products with the exploitation of mineral resources, as well as a panoply of programs, organized in various vectors, for the effective implementation of benefit sharing in the municipality. The main conclusions and recommendations of the study are set out in Chapter V.

1.2. Lithium and the lithium market

In recent years, lithium has become one of the resources with the greatest potential interest, both among extractive and chemical companies, among the countries where there are reserves of this material. Lithium is relatively abundant in the earth's crust, being the 27th most abundant element in the lithosphere.

Lithium is the lightest, most reactive metal known. It is not found in nature in a pure metallic state. It exists in the form of compounds, which are currently essentially extracted from two main sources: the salt flats of closed basins and the hard rocks.

Most of the world's lithium reserves are in closed basin salt flats ('Salars', 58%). The extraction of deposits is carried out through the pumping of brine (water with high concentrations of inorganic salts), where it is concentrated by evaporation in the open air. The resulting solution, with a high concentration of lithium, is subsequently transformed into lithium carbonate or lithium hydroxide.

Approximately one quarter of the world's reserves (26%) correspond to lithium concentrated in pegmatites. Most pegmatites are composed of granite, which contains quartz, feldspar and mica. Some pegmatites have some rare metals, such as lithium, cesium and tantalum[3]. These pegmatites from which lithium is obtained, are worked both from surface and from underground. The mineral containing lithium is spodumene, which after being concentrated locally, can later be converted into lithium carbonate or lithium hydroxide.

Most of the world's lithium reserves in salars are concentrated in the so-called "Lithium Triangle", which covers territories of Argentina, Bolivia and Chile. There are other areas with potential in other regions, but reserves are much less significant.

In the world there are a significant number of LCT pegmatite deposits, but only a small number of them exploit lithium today. The larger ones are located in Australia, Zimbabwe, Brazil and China. There are deposits in other countries, including Afghanistan, Austria, Canada, Chile, the Democratic Republic of Congo, Finland, Ireland, Russia, Spain, the United States, Portugal and Uzbekistan (Christmann *et al.*, 2015).

In other locations, there are other sources of lithium, namely Canadian shales, brines in oil wells in Canada and the United States, greisen/aplite in France, clays in Mexico and the United States, lacustrine sediments in Serbia and geothermal brine in the United States (Christmann *et al.*, 2015).

Lithium is extracted from the salt flats by evaporation of water and fractional recrystallization of salts[4], while in the case of rocks it is obtained by grinding procedures, leaching and chemical treatment[5]. Several international consultants[6] predict that in the coming years, despite their higher production costs, the extraction of lithium from hard rocks will grow more than from brines. This is due to differences in the lead times to

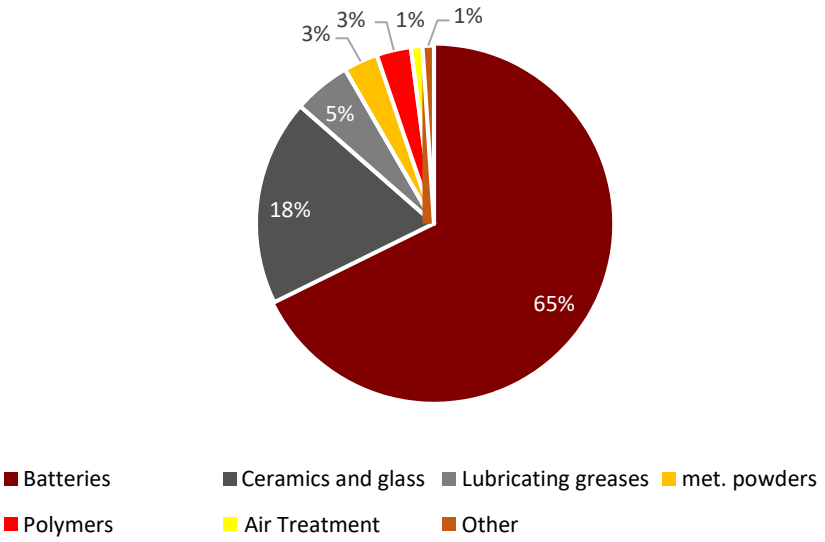
[3] So-called LCT (lithium-cesium-tantalum).
[4] The extraction of large volumes of brine can have negative hydrogeological consequences.
[5] The main risks are related to pollution of waterways if no preventive measures are taken.
[6] *Accenture* in particular.

production, as in the case of the salars it can take between seven and ten years.

For several decades lithium has been used in various industrial activities, namely in the manufacture of medicines, ceramics, glass, synthetic rubber and lubricants, as well as in the aluminum, aerospace and nuclear production sectors. However, in recent years much of its production has been channeled into the manufacture of batteries. Its low weight, together with its high reactivity and chemistry, makes lithium an ideal component for the manufacture of high-performance electric batteries. The electrodes manufactured with this metal are lighter, smaller in size and more durable than those manufactured with lead, copper, vanadium or with alloys of nickel and zinc.

The exponential increase in lithium demand in recent years is mainly due to the explosive growth in the use of lithium-ion batteries in the electronics and automotive industries[7]. The first rechargeable lithium-ion battery was marketed in the early 1990s and since then the use of these batteries in electrical appliances has grown exponentially. In 2019, 65% of lithium production on a global scale was destined to the manufacture of batteries (Statista, 2020). Three years earlier, in 2016, the proportion intended for this purpose represented only 50% of the total[8]. Other relevant uses of lithium are the manufacture of ceramics and glass (18%) and the manufacture of greases for various purposes (5%) (Figure 1.1).

Figure 1.1 - Main Uses of Lithium 2019



Source: Statista (2020).

[7] The growth in demand derived from the electrification of the automotive industry is expected to have a much greater impact in terms of demand than the widespread adoption of mobile phones. A Tesla S car carries 6 kg of lithium in 7,104 batteries, while a conventional smart phone carries 350mg of lithium in a single battery (Calvo, 2019).
[8] In 2012, only 7% of the lithium marketed was dedicated to the manufacture of batteries.

In 2018, the world production of lithium reached 85,000t, representing an increase of 23% compared to 69,000t produced in 2017 (Table 1) (U.S. Geological Survey, 2019). Overall lithium production capacity was 91,000t in 2018. The world's leading producers are Australia (51,000t, 60%) and Chile (16,000t, 18.8%), followed by China (8,000t, 9.4%) and Argentina (6,200t, 7.3%) (Table 1.1). Since the beginning of the decade, these countries have significantly increased their production. Between 2010 and 2018, Australia multiplied its production by more than five times, China and Argentina doubled it and Chile increased it by 60%.

The increase in production between 2017 and 2018 was mainly due to the opening of new projects, notably spodumene-based projects in Australia. Most of the world's lithium production is concentrated in five spodumene projects in Australia and two in salt flats, one in Argentina and one in Chile. In 2018, increased spodumene production allowed Australia to maintain leadership on a global scale. In that country, several projects are in the early stages of operation and others will start operating in the short term. This will ensure significant increases in supply in the coming years.

Table 1.1 - World Production (t lithium metal equivalent)

	2017		2018	
Country	**T**	**Share**	**T**	**Share**
Argentina	5,700	8.3%	6,200	7.3%
Australia	40,000	58.0%	51,000	60.0%
Brazil	200	0.3%	600	0.7%
Chile	14,200	20.6%	16,000	18.8%
China	6,800	9.9%	8,000	9.4%
Namibia	---	0.0%	500	0.6%
Portugal	800	1.2%	800	0.9%
Zimbabwe	800	1.2%	1,600	1.9%
Total	69,000		85,000	

Note: Lithium Metal Equivalent – Lithium is found in nature in various forms and compounds with different concentration levels. To homogenize the information, the values are always given in equivalent lithium metal units, i.e. the quantity of lithium contained in ores, salts, etc.

Source: U.S. Geological Survey (2019).

Table 1.2 - World Reserves and Resources (t lithium metal)

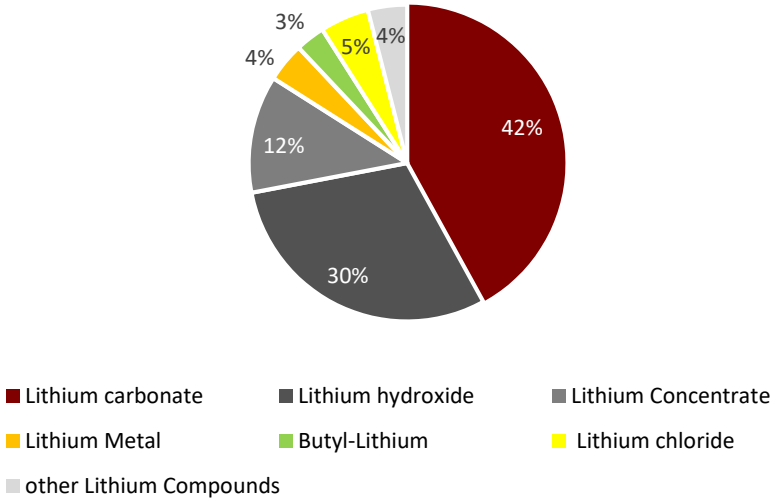
	Reservations		Resources
Country	**T**	**Share**	**T**
Argentina	2,000,000	14.3%	14,800,000
Australia	2,700,000	19.3%	7,700,000
Bolivia	---	---	9,000,000
Brazil	54,000	0.4%	---
Canada	---	---	2,000,000
Chile	8,000,000	57.1%	8,500,000
China	1,000,000	7.1%	4,500,000
United States	35,000	0.3%	6,800,000
Namibia	---	---	---
Portugal	60,000	0.4%	130,000
Zimbabwe	70,000	0.5%	---
Total	14,000,000		

Source: U.S. Geological Survey (2019).

The world's main lithium reserves, which currently total 14 million tons, are in Chile (8,000,000t, 57.1%), Australia (2,700,000t, 19.3%), Argentina (2,000,000t, 14.3%) and China (1,000,000t, 7.1%), and to a lesser extent in Zimbabwe (70,000t, 0.5%) and Portugal (60,000t, 0.4%) (Table 1.2). The known lithium reserves are sufficient to meet the very strong expansion of demand expected in the coming years, including without taking advantage of lithium from battery recycling (Lebedeva, *et al.*, 2017). The estimated lithium resources amount to 62 million tons, being mainly located in producing countries, namely Argentina, Chile and Australia. The only exception is Bolivia, which is not yet a relevant producer.

As mentioned, the growth in demand for lithium for batteries in recent years is explained by the massive incorporation of rechargeable lithium-ion batteries into portable electronic appliances and, increasingly, in electrical appliances, electric vehicles and storage equipment. The lithium-ion battery manufacturing industry is looking for lithium in the form of inorganic chemicals, in particular, carbonates and hydroxides. The reaction of lithium with carbon dioxide from the origin to lithium carbonate and with water to lithium hydroxide and hydrogen. Lithium minerals are directly used as concentrates in the production of ceramics and glass.

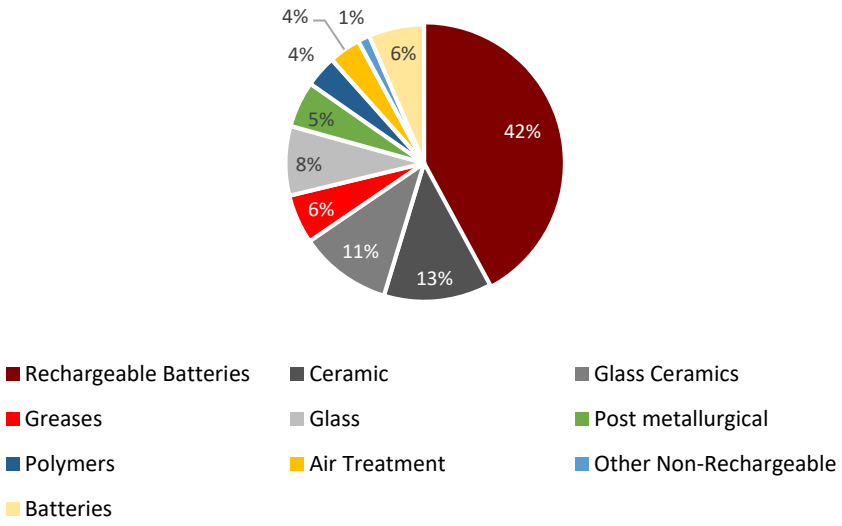
Figure 1.2 - Global Lithium Products Market



Source: InvestChile (2019).

The market share of the main lithium products is shown in Figure 1.2. The demand for lithium carbonate represents 42% of the market, while lithium hydroxide 30% of it. The demand for equivalent lithium carbonate was in 2019 higher than 276,000t. Of these, around 42%, i.e. 116,000t, were used for the manufacture of rechargeable batteries (Figure 1.3).

Figure 1.3 - Distribution of Lithium Demand 2019 (t Lithium Carbonate Equivalent)



Note: 1 Kg of Lithium Carbonate Equivalent = 0.1895 kg Lithium.

Source: Stormcrow (2019).

The supply of lithium carbonate is strongly concentrated on a global scale, as four producers: Albemarle (USA), SQM (Chile), Livent (USA) and Sichuan Tianqi (China) concentrate 83% of the world's supply of lithium carbonate (Lebedeva *et al.,*2017). Other relevant producers on a global scale are China's Jiangxi Special Electric Motor, Sichuan Yahua Industrial Group and Australia's Galaxy Resources, Neometals and Orocobre. Albemarle has operations in The United States (Silver Peak), Chile (Salar de Atacama) and indirectly in Australia (Greenbushes, through Talison Lithium). SQM has a large operation in Chile (Salar de Atacama) and has a joint venture operation in Argentina (Cauchari-Olaroz, with Lithium Americas). Livent produces primarily in Argentina (Salar del Hombre Muerto) and has supply agreements with companies from several countries. Finally, Sichuan Tianqi concentrates its operations in China, but also has holdings in Australia. It is currently the largest producer of lithium from hard rocks (López *et al.*, 2019).

Projections indicate that by 2030, the supply of lithium carbonate will grow by more than 130%, up to 830,000t (Stormcrow, 2019). The new large-scale holdings will add around 200,000 tonnes to supply. Supply growth will be driven by doubling production on projects in Chile and Greenbushes in Australia (Table 1.3).

The increase in the production of lithium and some of its derivatives is justified by the expansion of demand associated with the manufacture of batteries for electric vehicles. By 2020, lithium-ion batteries will become the main segment in the battery market, surpassing for the first-time acid batteries and being far ahead of nickel batteries. Forecasts indicate that global demand for lithium-ion batteries will multiply by twelve between 2018 and 2028, from 145 GWh to 1,700 GWh, with annual growth exceeding 30%[9].

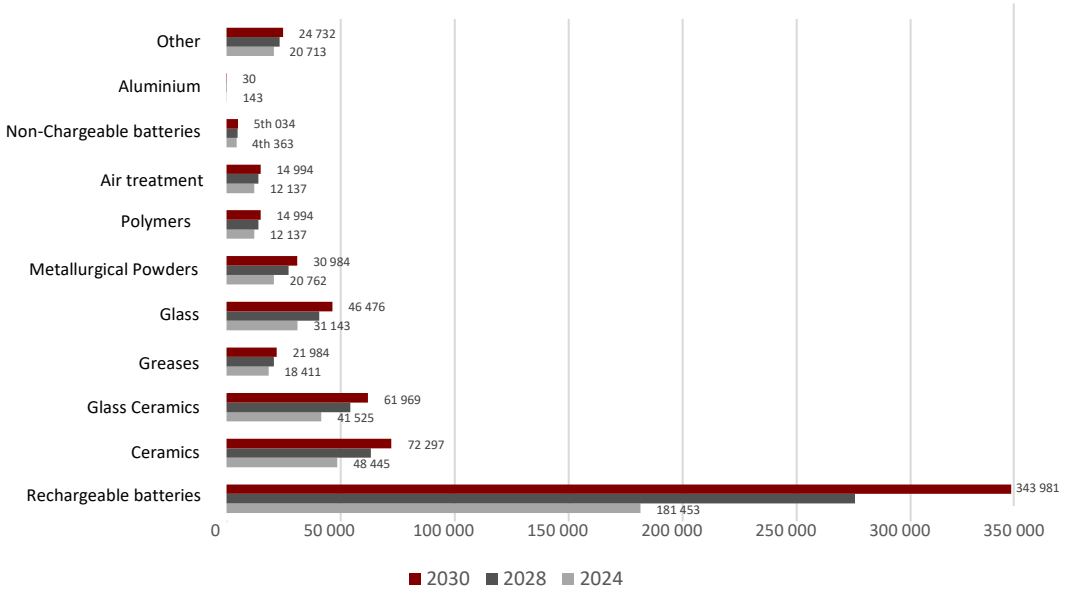
[9] IDTechEx.

Table 1.3 - Projections for Lithium Supply (t Lithium Carbonate Equivalent)

Producer	2019	2024	2029	2030
Chile	47,900	95,000	95,000	95,000
Greenbushes, New	105,000	150,000	180,000	200,000
Domestic China	25,000	45,000	55,000	75,000
SQM Bikita	5,500	5,500	5,500	5,500
Orocobre, New Year	17,000	17,500	30,000	35,000
Livent	22,000	22,000	22,000	22,000
Rockwood Brine	75,000	105,000	105,000	105,000
Lithium Americas/Ganfeng		20,000	40,000	40,000
Nemaska, Georgia	5,000	36,000	36,000	36,000
Galaxy Resources (Arg)		10,000	20,000	20,000
Galaxy Resources (Arg)	30,000	30,000	30,000	30,000
Neometals/MIN/Ganfeng (Aus)	25,000	25,000	25,000	25,000
Additional Australian Hardrock		20,000	50,000	60,000
Posco		55,000	75,000	75,000
Frontier Lithium		5,000	7,500	7,500
Total	**357,400**	**641,000**	**776,000**	**831,000**

Source: Stormcrow (2019).

Figure 1.4 - Projections for Lithium Demand (t Lithium Carbonate Equivalent)



Note: Only the values corresponding to the years 2024 and 2030 are included in order to facilitate reading.

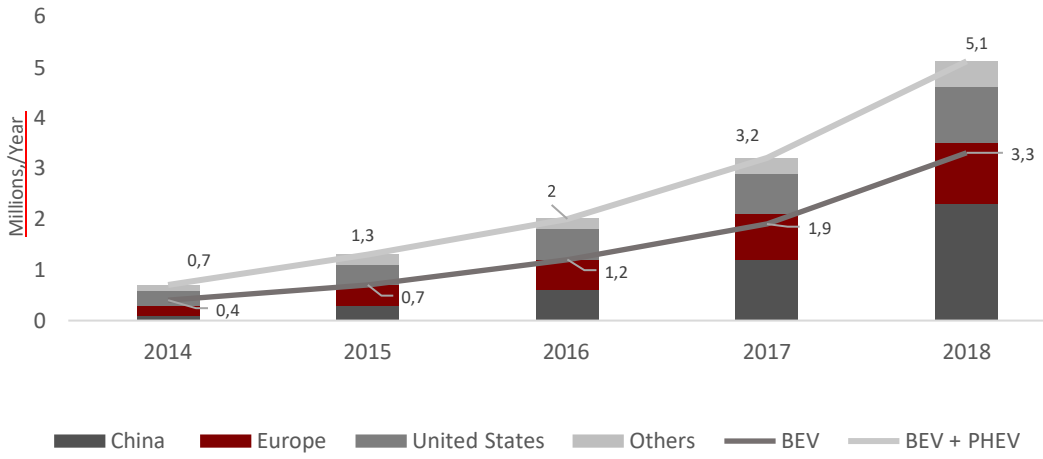
Source: Stormcrow (2019).

Demand for lithium carbonate is expected to increase by more than 130% between 2019 and 2030, from 275,000 tonnes to close to 640,000 tonnes. The strong expansion of demand for rechargeable batteries, which will drive associated demand from 116,000 tons in 2019 to 345,000 tons in 2030 is the main explanatory reason for the growth in demand for lithium carbonate in this period (Figure 1.4). The increase in production and corresponding economies of scale are expected to reduce the production costs of lithium carbonate very significantly, probably by half, within ten years.

Within the rechargeable battery market, the battery segment for electric vehicles (private vehicles and buses) will be the most dynamic by 2030. The battery segment for electronic devices will no longer grow and may even fall before recuperating, when the reduction of battery costs allows to incorporate them into other types of devices.

In 2018, the number of electric vehicles in circulation on world markets exceeded 5 million (Figure 1.5). Two-thirds of the market are fully electric vehicles and the remaining third hybrid vehicles. The main market for electric vehicles is the Chinese with 2.3 million vehicles, followed by the European with 1.2 million and the American with 1.1 million.

Figure 1.5 - Evolution of the World Stock of Electric Vehicles



Notes: Millions of cars.
BEV - Electric Battery Vehicles; PHEV - Hybrid Vehicles.

Source: IEA-based.

The number of electric vehicles in circulation globally is expected to be between 40 and 70 million by 2025 between 100 and 200 million in 2035 and between 400 and 500 million (BNEF, 2020) by 2040[10]. It is estimated that by 2040 the number of commercial electric vehicles will be approximately 40 million. In 2018, 2 million electric vehicles were sold worldwide; forecasts point to annual sales of 10 million in 2025, 28 million in 2030 and 56 million in 2040 (BNEF, 2020). Sales of electric vehicles will exceed those of internal combustion vehicles between 2035 and 2040. Currently batteries account for up to 40% of the value of a car (EESI, 2017).

Another potential source of demand for rechargeable batteries will be energy storage. The global expansion of renewable energy over the past few decades has allowed significant cost reductions. In addition, technological developments in this domain allows the installation of domestic systems of renewable energy production, which cover a significant part of the demand of households (and businesses). If there is efficient and inexpensive technology, the next step is to store energy and sell it to the grid.

In this context, fixed lithium-ion batteries are expected to account for about 10% of the battery market[11]. Annual electricity storage in 2050 is expected to increase at least tenfold compared to 2015 (European Commission, 2018). It is hoped that, by the same date, the storage is the main way of integrating renewable energies into the energy system.

[10] Other sources present more optimistic forecasts. For example, according to Tsiropoulos I. *et.al.* (2016), by 2040 the number of electric vehicles will be around 900 million.

[11] However these batteries will have to compete with other technologies, namely with redox flow batteries.

1.3. The Mina do Barroso project

1.3.1. The background

In 2001, the Portuguese State assigned to Saibrais, S.A. the rights of exploration and research, in the mine area, of mineral deposits of feldspar, quartz, lithium, tin, tungsten, niobium and tantalum. Under this agreement, Saibrais, S.A. developed studies leading to the identification of outcrops of aplitopegmatite containing feldspar. These studies confirmed the existence of economically viable reserves and enormous potential for feldspar exploration. It was also confirmed that aplitopegmatites contained lithium minerals, such as petalite and spodumene, the latter being predominant.

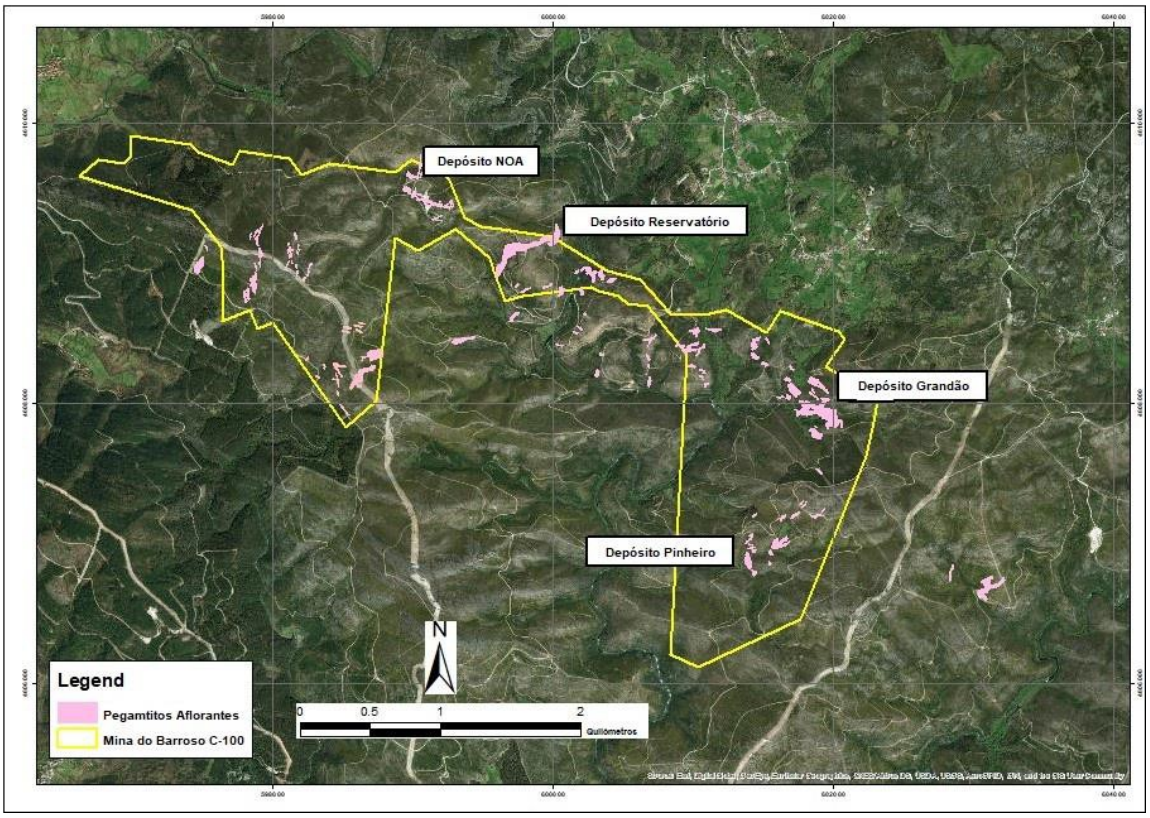
In 2003, based on the promising results obtained in the exploration and research work carried out by Saibrais, S.A., the process of obtaining the rights to exploit mineral deposits of feldspar began. The process in question included an Environmental Impact Assessment (EIA) procedure.

In 2006, Saibrais, S.A. signed a concession contract with the Portuguese State, which included an area of approximately 120 ha. In 2010, the rights to the Barroso Mine concession contract were transmitted by Saibrais S.A. to Imerys Ceramics Portugal, S.A., and the project's Mining Plan was updated to include the rights for mineralised areas identified from 2006. In 2016, the revised Mining Plan was approved by DGEG, with an addition to the concession contract, expanding the concession area to about 542 ha and including lithium as a concession substance. The limits of the Concession Area C-100 and the location of pegmatite outcrops are shown in Figure 1.6.

In 2017, the C-100 concession was transferred to Slipstream Resources Portugal Unipessoal, Lda., which that same year signed a partnership agreement with Savannah Lithium, Lda. Under the agreement, Savannah was responsible for developing exploration and research work to define the potential for lithium mineralization for its processing and subsequent sale. Since that date, Savannah has been taking a growing stake in the project until, in mid-2019, it took control of the entire capital, acquiring the last 25% that was still owned by Slipstream Resources and other small shareholders. Figure 1.7 provides a summary of the project’s chronology.

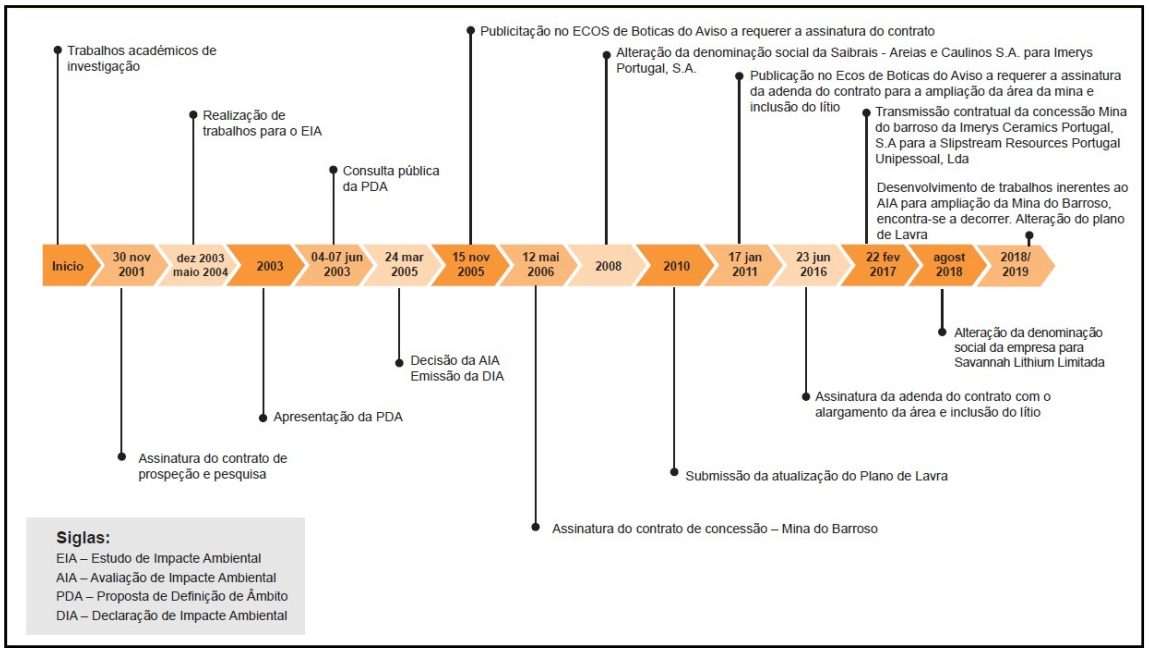
The promoter of the Barroso Mine project is Savannah Lithium, Lda. This company is a wholly owned subsidiary of Savannah Resources Plc. (Savannah), which is a mineral exploration and development company listed on the London Stock Exchange (AIM) with operations in several jurisdictions. Currently, Savannah has three projects under development: a heavy mineral sands project, in partnership with Rio Tinto, in Mozambique, which was recently awarded three Mining Licenses; a copper project in Oman, in the final phase of licensing; and the LCT pegmatite exploration project in Portugal.

Figure 1.6 - Concession area C-100, Mina do Barroso | Location of Pegmatite Deposits and Outcrops



Source: Savannah.

Figure 1.7 - Mina do Barroso Project Chronology



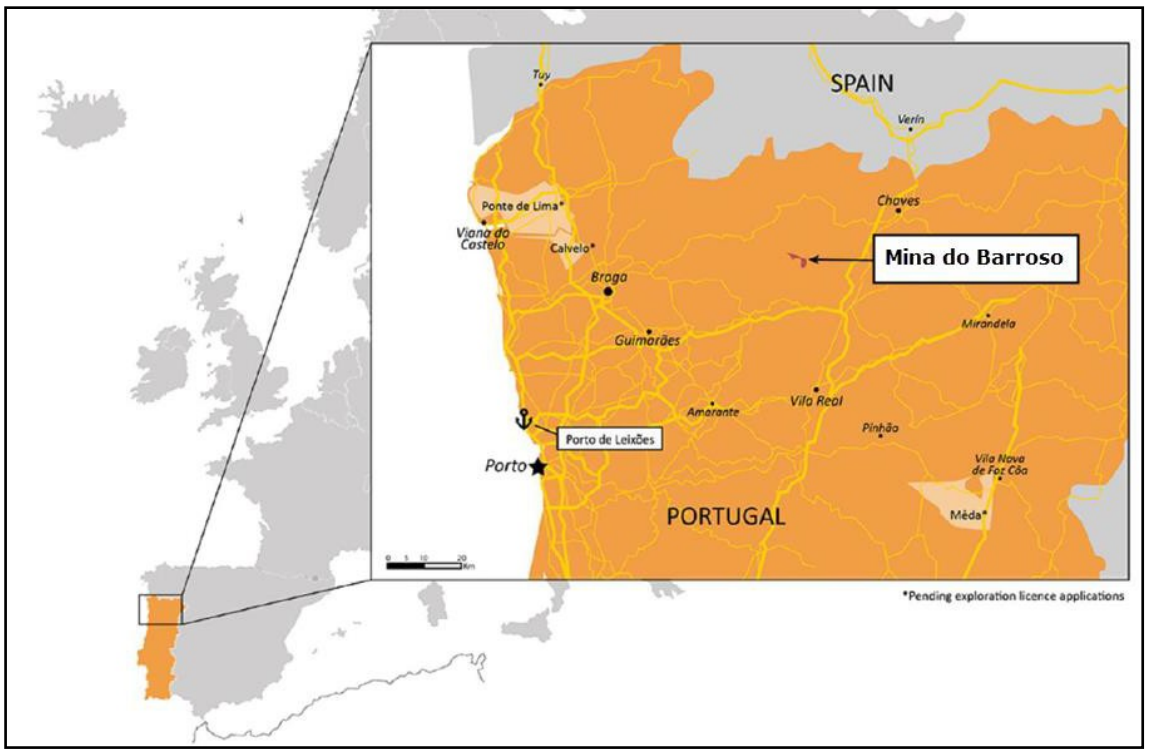
Source: Savannah.

Under the Mining Plan, Savannah expanded the exploration concession area from 542.1230 ha to 681.2876 ha, with an increase to the North and East. The increase in the concession area is justified by the results obtained in the works of recognition of the mineral deposit that the company developed, and which revealed that some mineralized bodies extended outside the concession area.

1.3.2. The Project

The Mina do Barroso project is located in the North of Portugal, about 400 km north of Lisbon and approximately 140 km to the northeast of Porto. The intervention area of the Mina do Barroso is located in the parishes of Dornelas and Covas do Barroso (mostly in Covas do Barroso), municipality of Boticas, district of Vila Real, between the Barroso hills and the Tâmega River, about 12 km southwest of Boticas town (Figure 1.8).

Figure 1.8 - Location of the Mina do Barroso Project



Source: Savannah.

Access to the area is through a modern network of highways, from Porto, Braga and Lisbon. The last 16 km of access, from the A24 to the project, are carried out by national roads.

The Mining Plan includes three alternatives for access to project. The final alternative will depend on the solution that is selected in the IAI procedure. Specifically, the alternatives proposed are as follows:

- Alternative 1 – At EN 311, 1 km west after vilar, about 8 km west of Boticas, take the M519 south to Covas do Barroso, where access becomes the M1047 road (to the east) for about 3,700 m (about 1 km before Alijó), where there is a junction to the south that connects directly to the project (about 10.5 km);
- Alternative 2 and 3 – In Carreira da toma- se Hare (about 3.5 km west of Boticas) takes the N312 to the south, for about 12 km to the vicinity of Seirós, where there is a road to the west which connects directly to the project (about 8.1 km).

The Mina do Barroso project will have four surface workings/open pits: Grandao, Pinheiro, Reservatorio and NOA. The villages closest to the exploration areas are:

- Reservatorio and NOA – The nearest villages are all located to the northwest; are São Antigo, at about 2,000 m away, Dornelas, at about 2,500 m, Espertina, at about 2,300 m, and Vila Grande and Vila Pequena, both at about 3,000 m away;
- Grandao - The closest villages to this nucleus are Romainho and Muro, at about 560 m distance to the north, and Alijó, about 1,400 m to east-northeast;
- Pinheiro – The closest villages to this nucleus are Lousas, about 1,900 m to the west, Dornelas, about 3,000 m to the northwest, Gondiães, about 3,600 m to the southwest, and Covas do Barroso, at about 3,300 m away to the northwest.

The Barroso project covers private, entirely rustic, land, which belongs to several owners or that are classified as 'Baldios' (common land). Savannah owns several plots of land itself and also has several exploration (rental) contracts with private owners and the Commission of the de Covas do Barroso Baldios for sections within the concession area, where part of the works will take place.

The average extraction of spodumene-bearing pegmatite from the four open pits on the mine is expected to be at least 1,30,000 t/year. This material will enter a processing plant, located in the concession area, to produce spodumene concentrate. The mine will also have two to four tailings facilities to accommodate the rejected material from the plant and around 6,850,000 t/year of sterile overburden material.

1.3.3. Exploitation

The Mina do Barroso project to be developed by Savannah includes the exploitation of spodumene-bearing pegmatite for the production of spodumene concentrate, in a concession area slightly larger than 680 ha over an 11-year period. [12] It is foreseen that this concentrate is intended for lithium processing facilities and that the by-products of the exploitation, feldspar and quartz, serve as raw materials for the ceramic and other industries.

It is the largest conventional lithium (spodumene) project in Western Europe, based on the movement of non-reactive inert materials. It is estimated that the average annual production will reach at least 175,000 tons of spodumene concentrate (at 6%

[12] Although the operating time may be extended depending on the additional availability of mineral.

Li_2O). An initial investment of EUR 98.11 million is expected, with the following distribution:

- Extraction equipment: EUR 7.4 million
- Processing equipment: EUR 24.7 million
- Infrastructure: EUR 40.2 million
- Dry stack tailings storage facility: 5.0 million euros
- Environmental studies and works: EUR 8.9 million
- Engineering and management: 10.0 million euros
- Metallurgy: EUR 0.9 million

The construction of the project is expected to employ around 300 workers. When the project is in full operation, the direct employment associated with the project will be about 120 workers. During the planned operation period (11 years), the total costs of the project will be close to 690 million euros, of which about 510 million are operating costs, 140 million freight and 40 million royalties. The estimated revenue over the time horizon of operation will be 1,420 million euros, approximately, with more than 85% generated from export sales.

The project's EBITDA is estimated over the concession horizon to be 738 million euros (an average of 62 million euros per year). The estimated return period is 1.7 years and it has a net present value of 327 million euros before taxes and 221 million euros after taxes.

1.4. The framework of the project in Europe and Portugal

1.4.1. The European strategy for the battery sector

Europe wants to lead the energy transformation process by reducing energy demand, improving the efficiency of its uses, reducing dependence on fossil fuels and increasing renewable energy sources. In order to formalise its commitment to a safe and competitive low-carbon economy, the European Union has adopted the Union's Strategic Energy Framework[13]. This energy strategy is structured around five dimensions: (i) security of energy supply; (ii) fully integrated energy markets; iii) energy efficiency; iv) decarbonisation of the economy; and v) research, development and competitiveness.

Due to the acceleration of the transition to the use of clean energy, the demand for batteries will grow significantly in the coming years. The European Commission, in view of this trend and within the framework of its objectives to accelerate the transition to a sustainable and competitive economy at European level, considers that batteries are a strategic value chain for Europe. [14] Batteries and, more generally, electrification will be the main ways to reduce climate impacts and achieve carbon neutrality.

The creation of a battery value chain is an opportunity to strengthen and transform the European mobility industry. Completing this chain within the Union is essential to raise competitiveness and maintain Europe's industrial leadership in various sectors. The objectives of industrial policy are added to those of harnessing market opportunities, as the value of the European battery market will exceed EUR 250 billion from 2025 (European Commission, 2019).

Europe currently produces only 3% of battery cells worldwide, while Asia controls around 85% of global production. The European Union's high dependence on the import of battery cells could expose the automotive industry to high costs and risks in the supply chain and limit its ability to compete with companies from outside Europe, both on the European market and on the external market.

To avoid technological and supply dependence on competitors from outside the European Union and to take advantage of batteries' potential in terms of employment and activity, Europe is implementing an industry-led strategy to boost the battery value chain. The Commission, together with member states and relevant *stakeholders* in the sector, is boosting the development and consolidation of an innovative and competitive battery ecosystem that integrates all components of the value chain. It has therefore supported cooperation between players in the sector, promoted the formation of European consortia in research, innovation and manufacturing, and fostered the more effective use of financing mechanisms, in close collaboration with the European Investment Bank (EIB) and the Member States.

[13] COM (2015) 80 final.

[14] Under the *renewed EU Industrial Policy Strategy,* the European Commission is committed to strengthening the strategic value chains of the new technology sectors in Europe. The Commission's approach to the battery value chain is a test of the European Union's industrial strategy in the21st century.

As part of this strategy, in 2017 the *European Battery Alliance* (EBA) was created, involving the European Commission, the member states that showed interest, the European Bank of Investment, relevant industry companies and various players of the innovation system from several European countries. It is an industry-led initiative aimed at boosting battery production capacity in Europe through knowledge-based solutions. [15] The role of the EBA, supported by the European Union and the Member States, is to promote cooperation between industries belonging to the value chain. The network promoted by the EBA and coordinated by EIT InnoEnergy[16] integrates around 260 participants and is organised in various working groups dedicated to subjects as diverse as the value chain itself, financing, trade or R&D.

The Strategic Plan of the EBA contains a set of guidelines which include:

- ensure access to raw materials located outside the European Union, those of European origin and those resulting from battery recycling;
- support the full-scale manufacture of battery cells on European territory and the completion of a complete value chain;
- Strengthen industrial leadership by accelerating research and supporting innovation in both mature technologies (e.g. lithium-ion) and more disruptive technologies (e.g. solid-state batteries);
- Develop and strengthen highly skilled work along the value chain. This aims to provide adequate training and re-qualify and improve the level of qualification of the workforce and make Europe an attractive location to attract experts from the rest of the world;
- ensure that the manufacture of batteries in the European Union has the least possible environmental impact by laying down requirements for safe and sustainable production;
- Ensure consistency of activities with the Regulatory Framework of the European Union.

In mid-2018, the European Commission adopted the *Strategic Battery Action Plan,* which includes a set of measures designed to support, in different areas, the creation of the battery value chain for industry in Europe. It is intended that the chain to be developed is structured in six major segments: i) Raw materials and processed materials; (ii) manufacture of components for battery cells; (iii) manufacture of cells; (iv) manufacture of the battery pack; (v) manufacture of the electric vehicle; and vi) Recycling. [17] The measures included in the Action Plan are intended to ensure the supply of raw materials for the production of batteries from the European Union and external sources, to support research and innovation, to work with investors to promote the scaling and production capacity of innovative solutions and to invest in specialised skills.

[15]https://ec.europa.eu/growth/industry/policy/european-battery-alliance_en

[16] Community of Knowledge and Innovation of the European Institute of Innovation and Technology (EIT).

[17] The extractive and chemical industries supply a set of raw materials and processed materials used in the production of various cell components, including anode, cathode, electrolyte and separator. These components are subsequently assembled in individual cells which, in the next phase, are intended for the production of battery packs. When batteries reach the end of their life of their first use they are recycled or used for other uses.

In parallel with industrial policy actions, a set of legislative initiatives and facilitating measures are being developed. Those approved under the Commission's *European Low-Carbon Mobility Strategy* and the three Europe *on the Move* mobility packages are aimed at boosting both supply and demand for electric vehicles and associated demand, especially battery demand.

Member States are also adopting measures that will stimulate demand for electric vehicles, such as restrictions on diesel vehicles, restrictions on movement in urban areas or a ban on future sales of vehicles with internal combustion engines , and the adoption of tax measures and the environmental charges reflecting the external costs of transport. Manufacturers' business and investment strategies also go in the same direction, as they are mostly geared towards the progressive abandonment of diesel vehicle production and the strengthening of the production of hybrid, and electric or fuel cell-powered vehicles.

To improve its performance in the lithium-ion battery cell technology sector and achieve leadership in the next generation of battery technologies, Europe must make an important effort in research and development. To this end, the Commission launched in 2019 the European Platform for Technology and Innovation (ETIP) *Batteries Europe*,[18] made up of *stakeholders,* the scientific community and member states. It aims to promote research in priority areas in the field of batteries through initiatives and projects for cooperation and exploitation of synergies between the numerous research programmes launched at national and EU level.

Within the Community there are an increasing number of opportunities to financially support battery research and innovation. Since 2014, *Horizon 2020* has provided around€1.5 trillion to fund battery-related projects and low-carbon mobility. The European Regional Development Fund (ERDF) has also funded research and innovation projects related to efficient and low-carbon mobility.

The activity of the European Investment Bank (EIB) has focused on providing support for pioneering commercial demonstration projects through loans, guarantees and equity financing through the InnovFin (EDP) mechanism[19], for energy demonstration projects. The European Fund for Strategic Investments (EFEI)[20] has also supported a number of provisions in the battery sector in several European countries.

In the next Multiannual Financial Framework, the battery sector is expected to be supported through the financial instruments of the new InvestEU Fund[21]. In the coming years, pre-commercial demonstration projects in the field of low-carbon technologies, including energy storage, are also expected to be financed through the so-called Innovation Fund[22].

[18] This ETIP, launched in early 2019, is led by the European Energy Research Alliance (EERA), the European Energy Storage Association (EASE) and EIT InnoEnergy.
[19] https://www.eib.org/en/products/blending/innovfin/index.htm
[https] https://www.eib.org/en/efsi/index.htm
[21] https://europa.eu/investeu
[22] https://ec.europa.eu/clima/policies/innovation-fund_en

Currently, within the Framework of *the European Battery Alliance,* the possibilities of accessing public funding via State aid in the context of Important Projects of Common European *Interest* (IPCEI),[23] in this case in the field of batteries, are being exposed. In December 2019, the first IPCEI in the field of batteries was approved,[24] covering six European countries, France, Germany, Italy, Belgium, Finland and Sweden, led by the first two. The Commission has approved the granting of EUR 3,200 million in financial support to be provided by participating countries, which will enable up to EUR 5 billion additional private capital to be mobilised. The consortium is made up of 17 companies[25] and the star project is the construction of a large battery factory in France, whose construction will begin throughout 2020. Some European regions are promoting the establishment of other consortia, using the same figure and for the same purposes. Another project, in the form of IPCEI, in the battery sector, is currently pending approval by the Directorate-General for Competition, promoted by a consortium that groups eleven European countries, also led by Germany.

Together with several private partners, the European Commission is promoting the adoption of public-private collaboration models to support various activities in the low-carbon technology sector. In this context, the Commission and Breakthrough Energy signed a Memorandum of Understanding for Breakthrough Energy Europe (BEE) at the end of 2018. It is a common investment fund to support innovative European companies, which focus on the development of disruptive technologies in the field of clean energy and its introduction to the market. The fund, which entered into operation in 2019, has an initial allocation of EUR 100 million.

Substantial investments are needed for the development of a value chain for batteries and for the mass production of batteries. It is estimated that to meet the demand of the European market it is necessary to build 20 to 30 factories for the production of battery cells. In addition, related ecosystems should be considerably strengthened[26]. Europe is expected to develop a production of 207 GWh of batteries for electric vehicles by 2023, and to increase this in later years to keep up with growing demand, which is expected to approach 400 GWh by 2028.

The first step in creating a European value chain, enabling the manufacture of large-scale batteries, was the construction of a pilot plant for the production of advanced lithium-ion cells in Vasteras, Sweden. The construction of the plant, which is currently in operation, was partially financed through a loan of €52.5 M from the European Investment Bank. This pilot project, with a production capacity of 125 MWh annually, has as main objectives to develop, test and industrialize battery cells

[23] Important *Projects of European Common Interest* are projects involving more than one Member State, contribute to the Union's strategic objectives and have positive effects on the European economy and society as a whole. The Treaty on European Union allows for state aid to be granted for projects of Community interest.

[24] This is the second Major Project of European Common Interest (IPCEI), after the one approved at the end of 2018 in the field of electronics. This IPCEI, promoted by Germany, France, Italy and the United Kingdom, is worth approximately €2 billion.

[25] Among which BASF, Opel, BMV and Solvay

[26] InnoEnergy EIT.

for various uses, before increasing its production on a commercial scale. The next step for the promoting company, Northvolt AB, will be to build a large-scale plant in Skelleftea, also in Sweden, with a capacity of 32GWh, which is expected to go into operation in 2023.

To ensure the plant's supply, Northvolt AB has signed an agreement with Nemaska Lithium, which has planned to produce lithium hydroxide at a new generation plant in Sawinigan, Quebec. When both plants are in operation, Nemaska Lithium will supply Northvolt AB with between 3,500 and 5,000 tons of high-grade lithium hydroxide for the manufacture of batteries over a 5-year period.

In addition to this initiative, there are others promoted by various consortia in several European countries. For example, one of them focuses on the development of advanced lithium-ion batteries and lithium-ion solid state batteries. Others are developing initiatives in the fields of raw materials and recycling, related to the production of essential materials for electric vehicle batteries.

Access to raw materials is key in a strategy for developing such a value chain (initial segment of the chain). Access to the five essential raw materials for batteries (lithium, nickel, cobalt, magnesium and graphite) is a challenge to the safety and reliability of Europe's supply. Its offer is in some cases very concentrated in a limited number of countries, sometimes with instable political situations. [27] The dominance of the lithium-ion battery supply chain is currently dominated by China, largely because it holds a large share of the refining and processing capacity of those materials. For the other materials essential for the manufacture of electric vehicles the situation is very similar.

The current context places Europe in a situation of extreme fragility, very dependent on these suppliers and conditioned by conjunctures of trade war and exchange rate instability, geopolitical and geostrategic tensions, internal political problems and situations of labour exploitation or systematic environmental degradation. In order to reduce this dependence on imports of raw materials for batteries, it is necessary to facilitate access to internal primary and secondary sources in the European Union and to ensure a safe and sustainable supply to other resource-rich countries.

The European Union regularly publishes a list of raw materials whose supply must be prioritised and guaranteed (European Commission, 2018). This supply from abroad must be carried out in a fair, sustainable and ethical manner, and should be positively awarded to various Sustainable Development Goals. [28] In the context of its trade policy, the European Union seeks to include provisions on raw materials in bilateral free trade agreements to ensure sustainable supply[29]. The list of critical raw materials serves as the basis for the negotiation of those agreements.

[27] For example, the Democratic Republic of the Congo, where 69% of the world's cobalt supply is concentrated.

[28] In accordance with the commitments of the European Union to the Framework of the World Trade Organisation (WTO) and the United Nations (UN). a

[29] They have been included in the agreements with Canada and Mexico and are being negotiated with Australia and Chile.

Internally, the increased use of Europe's existing geological potential would reduce the risks in supplying raw batteries, including cobalt, lithium, natural graphite and nickel. While this potential is limited, given the future needs of the European value chain ahead, the exploitation of raw materials within the Union is essential to reduce dependency and ensure sustainable supply. Moreover, the above-mentioned list of critical raw materials aims to encourage European production of raw materials and support the launch of new mining initiatives in the extractive industries.

To fulfil this aim, extractive industries must improve exploration processes, increase cost and resource efficiency and attract investment and capacity. In addition, they should make a push to improve their own social acceptance, through information about their activities and projects and their involvement with local communities. In another dimension, a strategy for the transformation of these raw materials into materials for batteries in the European territory should be implemented[30], in view of the fragility of the current supply of transformation, the financing of which can be linked with the European Investment Bank.

To this end, the European Institute of Innovation and Technology (EIT), an entity of the European Union, formed EIT RawMaterials, which is the largest consortium in the raw materials sector worldwide. This consortium aims to improve the competitiveness of the European minerals, metals and materials sector, and the associated value chain based on innovation, education and entrepreneurship.

EIT RawMaterials brings together more than 180 project partners from industry, universities, and research institutes in more than 20 countries of the European Union. EIT RawMaterials partners cover the entire value chain, from exploration, mining and processing to replacement, recycling and the circular economy.

1.4.2. The importance of the project for Portugal

The change in the energy paradigm and the potential growth of battery production in the coming years raises the question of the positioning of the Portuguese economy in the development of the battery value chain within the European Union. The location of Europe's largest lithium reserves makes it inevitable to discuss Portugal's role in building the aforementioned value chain. The debate surrounding this subject suggests a reflection on other matters, namely on the role of the extractive sector in the Portuguese economy.

Portugal is a country with limited natural resources in terms of market value. The weight of the extractive industries sector in GDP is one of the lowest in the European Union (Table 1.4). The potential of mineral resources in Portugal is severely underutilized, despite the value associated with some of them. The lack of investment in the sector may be related to the poor legal framework, the poor image of these industries and the procedural barriers that companies face in the exploration, development and exploitation phases.

[30] Aligned with a strategy for the recovery, re-use and recycling of these materials in the European Union.

Table 1.4 - Importance of Extractive Industries 2016| Sample of European countries

Countries	Weight in VAB	Export Weight
Poland	3,36%	1,80%
Romania	3,04%	0,79%
Bulgaria	2,34%	0,81%
United Kingdom	1,08%	0,86%
Sweden	0,84%	1,56%
Portugal	0,51%	0,92%
Spain	0,27%	0,26%
Germany	0,27%	0,08%
Media - European Union	0,67%	0,75%

Source: Eurostat.

The weight of extractive industries in exports is also very low, notably less than 1% of the total. Although in the last six years Portugal has managed to keep its external accounts close to balance and, in some years, have even reached surpluses, net external indebtedness is still one of the highest in the world, being more than 100% of GDP. In recent years, exports have played a crucial role in the recovery and growth of the Portuguese economy. Maintaining a path of sustainable growth, in an indebted economy and in a demographic contraction, will depend largely on export growth. In this sense, and given the potential of the extractive industries sector, strategies should be defined to promote investment and exports in a sector with a significant under-exploited potential.

Although in global terms Portugal's lithium reserves are relatively low – 60,000t and 0.4% of the global total (Table 1.2) – Portugal stands out for being the European country with the highest lithium reserves. Despite the market opportunities derived from the high demand for lithium associated with the manufacture of batteries, Portugal, unlike the countries with higher reserves, still does not take advantage of this impulse, since it has an average level of production identical to that of the beginning of the decade (800t)[31], with no new production underway and those projects which are planned are facing major licensing difficulties.

The exploitation of endogenous resources, such as lithium, should be taken into account in the context of a development strategy based on the promotion of tradable goods. However, harnessing the potential of lithium exploration for export growth and the economy will depend on the ability to use competitive advantage, derived from resource availability, to leverage the country's participation in the value chain of battery production projected for the European Union.

Access to lithium is one of the necessary conditions for the existence of a complete battery value chain. The lithium reserves in the national territory are excellent

[31] Between 2010 and 2018, Australia, which is the world's largest lithium producer, multiplied its production by more than five times. In the same period, Chile (the largest producer in 2010) increased its production by 60%, and China and Argentina doubled production.

opportunity to position the Portuguese economy in the value chain in Europe, contributing to its self-sufficiency in a strategic sector for the European economy.

This last aspect is extremely important, and that security in the supply of lithium is a priority for the European Union and for the companies that are part of the battery value chain ecosystem. As previously pointed out, strategic alliances and *joint ventures* between downstream companies in the value chain and extractive companies ensure a safe, reliable and diversified supply to battery producers and the automotive industry.

Despite the opportunities offered by this new market, if Portugal's position in the battery value chain is limited to lithium extraction, the macroeconomic benefits of this activity will be limited. For these benefits to be relevant, integration into the battery value chain needs to cover other phases with greater added value.

Integrating several phases of this value chain could have a profound transformative effect on the Portuguese economy and the structure of its exports. Portugal should therefore take advantage of the European Union's incentives to create a global battery production ecosystem under the *renewed EU Industrial Policy Strategy*.

Using the investment incentives included in this industrial policy strategy, Portugal should seek to integrate research, innovation and production consortia. Success in the process of extraction and concentration of spodumene/lithium can strengthen Portugal's position in this value chain if it contributes to leverage, in the medium term, the construction of a large battery factory. This is one of the objectives of the Portuguese Government within this strategic value chain for Europe in general and for the European mobility industry in particular.

Chapter II. Extractive Industries, Development and Benefit Sharing

Chapter II. Extractive Industries, Development and Benefit Sharing

2.1. Territorial development, sustainability and extractive industries

The debate on intensive exploitation of mineral resources is, in most cases, dichotomic and overly simplistic. Overly market-centric views underline the contribution of extractive industries to economic growth, increased exports and the attraction of Foreign Direct Investment (FDI). Additionally, they also highlight their contribution in terms of tax revenue and income from work, although without references to redistributive issues and social and environmental impacts. Finally, the arguments in favour of extractive industries are part of their role in strengthening the infrastructure allocation and its activities in the context of corporate social responsibility practices.

The views overly focused on social dimensions highlight the 'extractivist' character associated with exploitation in enclaves of large volumes of natural resources, which are exported without local transformation and, therefore, with little added value. Additionally, they emphasize the risk of 'primarizing' of the local productive structure and the intensification of territorial and productive asymmetries. Within this perspective, the environmental and social consequences, expressed in impacts on ecosystems and water demand, on the generation of pollution and environmental liabilities and on the displacement or disruption of local communities, are highlighted.

Such antagonistic perspectives polarise the debate and contaminate decision-making on this issue. The systematic postponement of decisions or the lack of action postpones or conditions the development of territories rich in mineral resources, but with little potential for development within the framework of dominant economic and productive trends. The non-use of its natural resources prevents the transformation of the local production matrix and the sectoral complexification of its economic base.

In general, the links between development and territory are not interpreted unambiguously. In the literature on regional development and location there are several perspectives on this relationship, which respond to different readings and motivations, use alternative concepts and propose disparate interventions in the field of public policy.

From the synthesis of the various alternative theories and conceptualizations[32] it is concluded that local development is a set of political, institutional, economic and social dynamics that seek, in a coordinated way, to achieve common objectives in terms of well-being, coexistence and quality of life for all social groups of a given territory. This is a process of territorially localized structural change, which aims to strengthen the competitiveness of the territory in question.

Territorial competitiveness can be defined as the capacity of a territory to generate high and increasing levels of income and improve the standard of living of its populations (Meyer-Stamer, 2008). Territorial competitiveness includes four dimensions that combine

[32] The theory of local development, the approach to territorial competitiveness (comparative advantages and New Economic Geography), the approach to regional innovation systems, evolutionary approaches and the perspective of innovation, knowledge, learning and creativity.

in a unique way in each territory: economic, social and environmental competitiveness and positioning in the global context. Territorial competitiveness is therefore closely linked to productivity, but also to other socio-economic dimensions of regional or urban scope, which form part of the productive base of the regional economy, namely human capital, socio-institutional capital, cultural capital, creative capital and infrastructure capital.

Territorial competitiveness depends on the capacity of territories to provide a competitive context for companies and on the existence of processes of accumulation of knowledge (Camagni, 2002). Competitive companies contribute to enhancing territorial competitiveness through networks of innovation and knowledge, which allow leveraging of territorial competitive advantages and sharing them cooperatively. The consolidation of these networks allows the creation of territorial systems of innovation, which, in essence, are iterative networks consisting of companies of various dimensions, integrated in a *cluster,* higher education and research institutions linked to the productive sector, R&D laboratories and technology transfer centres or agencies, associations funding centres and government departments and agencies.

The link between local and global processes is adequately formalized in the analysis of Global Production Networks, which is divided into two major currents: global *commodity* chains and global value chains. The first are global networks of processes linked to the production of a *commodity.* The second are networks that cover the activities belonging to different phases of related productions, located in different locations on a global scale. The main purpose of the approach of these networks is to analyse the effects that global economic integration has on regional development. Policy interventions to promote development are oriented, in this case, to the modernization of industrial *clusters* and the improvement of existing value chains, through the creation of new firms and the attraction of FDI.

In the case of global mineral *commodity* chains, the production of these *commodities* is carried out by extractive companies, in the context of mining operations. According to Halland *et al*. (2015), the main characteristics of extractive industries are as follows:

i. They require large initial investments because they are capital intensive activities.
ii. They are associated with high levels of uncertainty derived from, among other factors, the volatility of mineral prices and the difficulty of accurately determining production costs and the size of deposits;
iii. Generate significant rents, particularly in the high stages of price cycles, which induce tensions and disputes on their property and application;
iv. They are organized in a concentrated way, due to property issues and barriers to entry, which gives high market power to the main *players* in the market;
v. They operate as non-renewable resources;
vi. They are located in specific locations of the territory to which they bring significant permanent change;

vii. On many occasions, they give rise to strong conflicts over the responsibility of the environmental and social costs associated with the activity and on its mitigation and repair.

In addition to environmental and social considerations, in some countries where mineral resources are expected, there is a negative view of extractive industries, given that in some regions mining development has resulted in enclave economies, where commodity production , mainly by foreign companies, is carried out on the margins of the local economy. These structures are characterized by the fragility of upstream and downstream links with extractive activity, the low density of labor markets and the limited *spillovers* of knowledge along the value chain. In this model the State is a facilitator of the transnational operations of extractive companies, guaranteeing them low levels of regulation and control. In enclave methods, mono-production results in low levels of added value and very limited impacts on the local economy.

On the contrary, in the model of inclusive and sustainable productive development, the development strategy entails the creation of upstream and downstream productive links in the value chain and the acquisition of goods and services locally, the complexification of the local productive structure and the promotion of projects that increase the incorporation of added value to resources natural extraction object. In this model the State assumes regulatory functions in economic and environmental matters and, at the same time, introduces mechanisms for capturing income. The strategy that accompanies this model allows generating higher employment, strengthening the productive structure and generating income locally and, if the regulation is adequate, reducing environmental impacts and minimizing social impacts on the community.

The main enabler of these development processes is the creation of productive bonds[33] between the leading company and its suppliers and customers. These links are classified into two major types: i) upstream bonds, which are those established with the producers of goods and services that serve as *inputs* in commodity production processes; and, ii) downstream bonds, which refer to relations with commodity companies' transformation of commodities for their incorporation into other production processes or their final consumption.

The organization in the global mining sector has experienced significant changes in recent decades. Increasing the levels of subcontracting of activities and services is an opportunity for generating upstream links with service providers.

This opportunity can be addressed locally by training local businesses. The great challenge for governments, particularly local governments, is to boost the growth and qualification of local suppliers, with the capacity to respond to the demands of the extractive company, in terms of quality, availability or delivery times. To this end, it is necessary that there are public policies that boost productive links at the local level. Usually the ones that produce the best results are those oriented to the creation and dynamization of platforms that integrate local companies, local governments and universities.

[33] *Production Linkages* (Hirschman, 1981).

Downstream links generally depend on the ability to generate synergies and complementarities between the extractive company's activity and that of the receiving, converting or transforming companies (first and successive transformations). However, in most cases, this vertical cooperation at the level of production between the extractive company and the other companies does not usually happen naturally.

Such articulation may require the action of national or regional governments, in particular in areas such as the mobilisation of capacities and investment in these spheres or the attraction of know-how and capital from abroad.

However, policies to promote ties based on knowledge and technology and on learning and ensuring cooperation standards along the value chain are also frequent. Although in many countries the initiative of these platforms is public in nature, there is an increasing number of public-private experiences.

In any process of territorial involvement the following dimensions are absolutely fundamental:

i. The participation of territorial actors – the population and economic, social and political actors must take responsibility for local development, and mobilise human, material and natural resources and harness the potential of their territory to raise the level of well-being and improve the quality of life in general;
ii. The affirmation of territorial identity – development processes must take advantage of and reinforce the cultural identity of their community. This understanding improves the ownership of the local reality and the approach to development challenges;
iii. The articulation – development processes must be based on a willingness to manage between public and private actors. Coordination between all of them is essential to promote their own resources and capacities and attract others from abroad, in order to generate new development projects that have their own identity;
iv. Planning – within the framework of development processes it is essential to establish objectives and priorities and to establish strategies that allow their materialization. To this end, the participation and involvement of local actors, companies and governmental and non-governmental entities is fundamental both in the design and definition phases and in the monitoring and evaluation phases;
v. The leadership of local governments – in sparse territorial contexts, where the local administration is the driver of development, it is essential that local government transitions from administration to management and assumes proactive leadership to guide and articulate the capacities and resources of its territory for the sake of development and well-being.

The profound changes in production processes, sectoral and market organisation and development in general require local governments to migrate from a public administration approach to an eminently proactive management approach. This change in the position of local governments in development processes is still

more relevant in territories with extractive activities, due to their ability to promote initiatives that allow the appropriation of part of the benefits of these activities.

Although extractive projects are generally an opportunity for the development of the territories in which they operate, there are a number of structural problems or those resulting from the development of extractive activities that may condition this development:

i. Power asymmetries between the various actors involved (in the fields of resources, knowledge and ability to influence);
ii. Poor coordination between central government and local governments;
iii. Lack of trust among the various actors involved;
iv. Asymmetries in the distribution of benefits between the company, the community and governments;
v. Deficits and ineffective mechanisms for community partition;
vi. Fragility of communication systems between companies and communities;
vii. Lack of planning instruments and resources;
viii. Scarcity of policies to promote and empower local companies that could potentially provide the extractive project;
ix. Reduced motivation of extractive companies to look for ways of collaboration to seize opportunities;
x. High incidence in communities of negative social and environmental impacts;
xi. Uncertainties regarding the management of environmental liabilities; and,
xii. Uncertainties about sectoral diversification capacity during exploration and, above all, after exploration.

The inadequate management of extractive activities can cause negative impacts on the environment, population displacement and significant interferences in the lives of communities, increased inequalities and intensification of conflicts at the local level, among other undesirable consequences. However, proper management can attract investment, generate jobs, increase income and stimulate innovation.

Current approaches to territorial development require development processes to be economically transformative, socially inclusive and environmentally sustainable. For this reason, the transformative impacts of extractive industries on a territory must be compatible with an increasingly comprehensive sense of sustainable development.

The 2030 United Nations Agenda for Sustainable Development and the Sustainable Development Goals (SDGs) are a comprehensive action plan for social inclusion, environmental sustainability and economic development. Extractive industries can contribute to these objectives through joint initiatives with governments, local communities and civil society in general (WEF, 2013).

In this way, extractive companies have, within their corporate responsibility, the obligation to align their operations with the SDGs. That is, the company's activity should

harmonised with objectives related to environmental sustainability, social inclusion, and economic development.

Extractive activities usually have consequences for land, water, climate, flora and fauna, as well as for those who have these resources. The objectives in the field of environmental sustainability are:

- SDG 6 - Clean water and sanitation
- ODS 7 - Easy-to-access, non-polluting energy
- SDG 13 - Climate Action
- SDG 15 - Life of terrestrial ecosystems

Extractive activities have consequences for local communities, as they generate both economic opportunities and problems related to livelihoods and human rights. The objectives in the field of social inclusion are:

- SDG 1 - End of poverty
- SDG 5 - Gender equality
- SDG 10 - Reducing inequalities
- SDG 16 - Peace, justice and sound institutions

Extractive activities have an impact on development and economic growth at local, regional and national level, generating potential investment, innovation and employment opportunities. The objectives in the field of economic development are:

- SDG 8 - Decent work and economic growth
- SDG 9 - Industry, innovation and infrastructure
- SDG 12 - Responsible production and consumption

In Box I, several actions grouped by thematic areas are indicated for each of the SDGs, which, if adopted by extractive companies, could contribute to improving the compliance of the SDGs (WEF, 2013).

In addition to being a requirement of local communities and governments, compliance with sustainability criteria is an indispensable condition for extractive industries to be able to market ores and their derivatives in certain markets. The European Union, for example, has increasing demands for compliance with sustainable principles and practices in the operations of extractive companies wishing to market minerals and their derivatives in Europe.

In this regard, in its strategy for the battery sector, the European Commission stresses the importance of extracting minerals essential for the production of batteries, such as lithium, must follow the highest ethical, just and sustainability standards, as only in this way can batteries fulfil their function in creating a decarbonised and more sustainable economy. It specifically considers that (European Commission, 2019, page 12):

> *Sustainable mining is a prerequisite for clean battery value chains. The Commission will facilitate work to develop a common set of principles for a society and environmentally sustainable mining sector in Europe and will encourage Member States to integrate these into their raw materials strategies.*

***Box I* - Contributions to improving the compliance with the SDGs (I)**

Extractive industries and poverty elimination (SDG-1)

1. Payment of taxes and other benefits
    i. Detailed publication of the amounts paid to governments
    ii. Application of standard of free pricing
2. Promoting inclusive employment
    i. Promoting equitable access to employment opportunities
    ii. Implementing of training and learning programs
    iii. Enhancement of local procurement mechanisms; Training of local suppliers
    iv. Strengthening local value chains
3. Preservation of access to land
    i. Start of land access planning from the initial phase of projects
    ii. Full recovery of displaced and resettled communities

Extractive industries and hunger elimination (SDG-2)

1. Establishing synergies with agriculture
    i. Transparent management of water resources
    ii. Reduction of land occupation to a minimum
    iii. Common use of infrastructure by the agricultural community
2. Ensuring no pollution on agricultural land
    i. Conducting geochemical reference and monitoring studies
    ii. Periodic control of water quality and soil fertility

Extractive industries, health and well-being (SDG-3)

1. Promoting health and safety at work
    i. Promoting health in the workplace
    ii. Establishment of a rigorous monitoring and reporting system on health and safety at work
    iii. Road safety
2. Provision and encouragement of preventive care services
    i. Diagnostic tests of common and professional pathologies
    ii. Ensuring the existence of healthy food alternatives in canteens and appropriate hygiene protocols
    iii. Prevention of toxic emissions to the environment
3. Combating work-related diseases in mines
    i. Reduction of dust and gases
    ii. Implementation of education, prevention and guidance programs on occupational diseases
4. Social awareness about mental health
    i. Application of a holistic approach to health
    ii. Implementation of confidential guidance programs
    iii. Conducting periodic tests to detect addictions, including alcohol

Extractive industries and quality education (SDG-4)

1. Assessment and improvement of the skills base at local level
    i. Systematization of reference assessments and systems for anticipating qualification needs
    ii. Sponsorship of learning programs and scholarships and graduate programs
2. Workforce training and education
    i. Training of the workforce in technical and management skills
    ii. Ensuring training opportunities for employees of all levels and all areas

***Box I* - Contributions to improving the compliance with the SDGs (II)**

Extractive industries and gender equality (SDG-5)

1. Ensuring equal opportunities for women
    i. Increased hiring of the number of women
    ii. Ensuring equal pay for women and men
    iii. Increase in the number of women in leadership positions
    iv. If possible, implementation of flexible schedules that facilitate the care of children
2. Application of the gender perspective in all activities and throughout the entire project life cycle
    i. Equipment specific to each gender protection
    ii. Planning the development of career prospects taking into account gender issues
    iii. Incorporating the perspectives of women, men and children into community-related decisions
    iv. Inclusion of men and women in negotiation and decision-making processes

Extractive industries, clean water and sanitation (SDG-6)

1. Water conservation and recycling
    i. Recycling or recovery of wastewater metals
    ii. Reduced water consumption
    iii. Use of alternative water sources, including wastewater or recovered rainwater
2. Water quality control
    i. Control of water sources, both those located near the mines and those located downstream of the same
    ii. Community participation in the public dissemination and monitoring of water-related data
3. Holistic management of water resources
    i. Harmonisation with government policies on water resource management
    ii. Integration of water technical, social, economic and political issues
    iii. Identification of high-value water zones
    iv. Maintaining a long-term balanced water supply in projects
    v. Incorporation of mechanisms for the dissemination of information on water resources

Extractive industries and affordable, non-polluting energy (SDG-7)

1. Improving energy efficiency
    i. Conducting energy audits
    ii. Improving energy infrastructure maintenance
    iii. Reducing local energy demand
2. Incorporation of renewable energies
    i. Incorporation of wind, solar or geothermal energy without grid connection
    ii. Diversification of energy sources to reduce overcharging problems
    iii. Replacement of fossil fuel-powered generators

Extractive industries, decent work and economic growth (SDG-8)

1. Information on the opportunities and threats (problems) of extractive activity
    i. Ensuring decent work
    ii. Fostering indirect and induced employment
    iii. Providing clear information on capital investment
2. Boosting economic growth behind local procurement mechanisms
    i. Diversification of local economies
    ii. Ensuring access to procurement and bidding processes for local companies
    iii. Training of local suppliers on how to meet the supply needs of the extractive company
    iv. Training of local businesses in general

***Box I* - Contributions to improving the compliance of the SDGs (III)**

Extractive industries, industry, innovation and infrastructure (SDG-9)

1. Support for local acquisition mechanisms
    i. Increased expertise of local suppliers
    ii. Improving the quality of goods produced at local level
    iii. Support to local suppliers in charge of providing services in mines
2. Common use of infrastructure
    i. Study of the possibility of achieving co-financing agreements with governments for enlargement, capacity building or infrastructure improvement
    ii. Common use of road and energy infrastructure, including rail
    iii. Approved economies of scale and reach

Extractive industries and reducing inequalities (SDG-10)

1. Anticipation of risks related to inequality
    i. Attention to existing wage differences at local level
    ii. Determination of statistics on well-being, before the start of extractive activity
2. Promoting inclusion
    i. Training, hiring and employment of an excluded or at-risk-of-exclusion population
    ii. Inclusion of companies owned by socially marginalised groups in local procurement processes in supply chains

Extractive industries and sustainable cities and communities (SDG-11)

1. Non-traditional mining
    i. Waste from mine reactivation
    ii. Linking metal recycling with the conversion of waste into energy
2. Careful land use planning
    i. Land use planning taking into account farm life
    ii. Anticipation of landscape recovery solutions after closure
    iii. Development of plans for the management of landscape, environmental and cultural her
    iv. Anticipation of solutions for unplanned precarious urbanization events in the vicinity of the project

Extractive industries and responsible production and consumption (SDG-12)

1. Reduction to a minimum of the amount of resources used and waste
    i. Reduced the amount of water, energy, earth and chemicals to a minimum
    ii. Reduced to a minimum the amount of waste, effluents and emissions generated
    iii. Reuse of inert rocks
2. Incorporate from the perspective of the life cycle
    i. Analysis of mineral and chemical products at all stages of the supply, transport, storage, use and production processes
    ii. Generalization of responsible sourcing practices among suppliers

Extractive industry and climate action (SDG-13)

1. Reduction of emissions
    i. Improving energy efficiency
    ii. Use of renewable energy
    iii. Use of low-emission fuels
    iv. Harmonisation with NCDCs - Planned contributions determined at national level
    v. Measurement of direct, indirect and product-related emissions and presentation of corresponding reports
2. Increased resilience to climate change
    i. Anticipation of the effects of climate change on mines and communities
    ii. Strengthening emergency response plans
    iii. Development of a model of climate-related environmental effects

***Box I* - Contributions to improving the compliance of the SDGs (IV)**

Extractive industries and climate action (SDG-13) [Cont.]

3. Recognition of the importance of climate change in investment planning
    i. Using hypothetical situation planning to define perspectives in terms of climate and energy-related risks and opportunities
    ii. Use of climate projections in the design and implementation of operations and infrastructure
    iii. Approval of business policies on climate change, carbon management and information dissemination
    iv. Use of virtual (shadow) carbon pricing to guide project portfolio assessment and investment decisions
    v. Inclusion of climate change in the administration's program

Extractive industries and the life of terrestrial ecosystems (SDG-15)

1. Obtaining positive net effects or zero net losses
    i. Applying a hierarchical mitigation approach to minimize the impact
    ii. Prevention of repercussions on essential habitat
    iii. Mitigation of effects on biodiversity
2. Preservation of services in ecosystems
    i. Recognition of the dynamic character of habitats
    ii. Carrying out comprehensive environmental impact assessments, both reference and monitoring

Extractive industries, peace, justice and strengthening of institutions (SDG-16)

1. Conflict prevention and anticipation
    i. Attention and rapid response to stakeholder concerns
    ii. Creation of formal and accessible complaint mechanisms
    iii. Participation in conflict-free mineral certification systems
2. Respect for the rights of communities
    i. Extension of the application of strict standards to companies in matters with impact on communities - safety, noise ...
    ii. In addition to incorporating the strategic aspects and formal requirements, integrating the objectives and views of the community and in decision-making

Extractive industries and alliances to achieve the Goals (SDG-17)

1. Mobilization of financial resources and technology
    i. Increased transparency of payment data to governments
    ii. Development of data collection capacity and statistical analysis
    iii. Transfer of technology to host countries
    iv. Participation in Public-Private Partnerships
2. Exchange of geographic data
    i. Transfer to national authorities of data on unused holdings
    ii. Improving knowledge about mineral wealth at national level
    iii. Promoting trust between government and communities

Note: ODS 14 was considered irrelevant in this context.

Source: Own elaboration based on World Economic Forum (2013).

2.2. Extractive industries and economic development - Review of relevant models

There is no linear and deterministic relationship between availability and exploitation of mineral resources and levels of development. The levels of development of countries such as Australia, Canada or Norway contrast sharply with those of many African countries, although they all have abundant mineral resources. The factors that are at the origin of these differences in terms of development are related to how this mineral wealth is used. In this regard, there is an increasingly broad consensus that these appropriation processes have a complex and markedly multidimensional character, which involves economic and technological dimensions, but above all political and institutional dimensions. In this context, it is increasingly relevant the insertion of the extractive industry in the regional and national productive structure is increasingly relevant, given that, from the point of view of development, what really matters is to generate productive chains and *knowledge spillovers.* [34]

A significant proportion of the systemic impacts caused by extractive industries are channeled through the productive chains they drive, as well as through the processes of generation, adoption and dissemination of innovations. The productive chains generated by extractive industries can contribute to scaling their impacts on production and employment, as well as to diversify and complexify the economy sectorally through the development of suppliers of goods and services or the industrialisation of the corresponding raw materials. Innovation and technological changes can contribute to improving efficiency and reducing the impacts of extractive industries, as well as to producing knowledge *spillovers,* through diffusion and imitation processes, innovation networks, initiatives and projects of formal and informal cooperation between public and private stakeholders*,* among others[35].

In order to ensure that the extraction of mineral resources has long-term impacts, particularly after the closure of the operation, industrialisation strategies, the development of supply chains with local companies and the leverage of innovative projects related to extraction should be adopted. In some cases, these strategies are associated with other programs in order to take advantage of the demand traction. It is a question of creating mechanisms to take advantage of the endowment of resources to create productive chains that generate productive, technological and management and marketing capacities, that enhance the value chain or that transfer to others associated with other sectors.

Chains can focus on knowledge-intensive activities such as the development of advanced materials, chemical and electrochemical processes, or energy accumulation systems. Alternatively, they can focus on less sophisticated activities, although poorly developed at local level, such as the provision of operation and maintenance services or logistics activities.

In the context of high-income countries, Australia and Norway stand out for their natural resource-based development experiences. The good performance of these

[34] See in this regard Lederman and Maloney (2012).
[35] See in that regard Venables (2016).

countries in this area is based on the processes underlying the chain dynamics and innovation in the extractive industries (Ville and Wicken, 2012). In Australia, the local cluster of equipment, technology and services for mining contributes significantly to exports. Most of these companies develop R&D activities and collaborate closely with science and technology system entities (Scott-Kemmis, 2013). In Norway, the productive chains have increased local content, both in the supply of equipment (50% of the total), and in the provision of operations and maintenance services (80% of the total), while the knowledge intensive ones have allowed the production and accumulation of engineering capacities to serve the local industry, but also for export purposes (Sasson and Blomgren, 2011).

In the case of both Australia and Norway, the promotion of linkages and the promotion of innovation capacities have been supported by specific public policies. In the Australian case, the policies were aimed at: (i) developing long-term capacity-building strategies through public-private partnerships; supporting innovation and vocational training through incentives; iii) promote exports; and, iv) foster the development of entrepreneurial capacities and cooperation with universities and research institutes (Urzua, 2012). In this case, in larger projects, companies are required to develop an impact study, which includes potential chains and strategic alliances, as well as the possibilities for knowledge transfer.

In the case of Norway the policies were intended to: i) generate human capital and training programs, through agreements between foreign companies and national universities in the field of research and training; (ii) promote R&D and transfer technology; and, iii) impose standards for advertising and circulation of information on contracts, to ensure equal opportunities for national suppliers. Although there are no minimum national hiring requirements, foreign companies have hired local suppliers, usually less capable and efficient, to ensure a good relationship with national and local authorities and to support local industry as far as possible (Sasson and Blomgren, 2011).

In developing countries, the generation of chains has proved much more difficult. For upstream chains, in mining operations (or similar) in middle-low-income countries local purchases account for only 12% of operating expenditure, while in middle-high and high income (OECD) countries they account for 58% of operating expenditure (Maennling, 2016). In this sense, chains in developing countries policies aimed at ensuring minimum local content have not been successful, due to the non-existence of companies with the skills, technology and information necessary to meet the demands of multinationals operating in extractive industries (Venables, 2016). On the contrary, policies to promote capacity in supply companies have produced better results, although their impacts in these contexts are still relatively limited.

With regard to downstream chains, in several countries attempts have been made to stimulate local processing of raw materials through restrictive trade policies limiting their export or industrial policies for the development of first-processing enterprises in the country[36]. In addition to other reasons relating to the implementation of these policies, in general these initiatives have not been successful, due to the scarcity of financial and technological capacity, skills and complementary inputs (Venables, 2016).

The design and implementation of policies to promote dynamism and innovation within extractive industries requires an understanding of the functioning of global value chains and the strategies of the multinationals that lead it. These aspects are essential to be able to integrate into them and, in the long term, improve the positioning of local businesses (Morris *et al*., 2012).

In recent years, several Latin American countries have implemented initiatives aimed at moving chains related to mineral extraction and innovative activities in this field. In most cases, public-private partnerships and knowledge networks have been the most used mechanisms to materialize these initiatives. Box II lists several initiatives developed in Latin America to promote ecosystems and innovative activities within extractive industries (ECLAC, 2016). In general, these policies have had relatively limited impacts due to: (i) scarcity or instability of resources; (ii) the local capacity deficit; (iii) failures in incentive mechanisms for the various parties involved; and iv) the lack of adequacy of coordination mechanisms between the parties, including between the different levels of government.

[36] Generally in mature, capital-intensive sectors with little innovation potential.

***Box II* - Initiatives to promote chains and innovative activities**

Vendor development and local content	In Brazil, the Brazilian Agency for Industrial Development (ABDI) has prepared a map of the supply chain of goods and services in extractive industries to propose a supplier development program under the National Mining Plan 2030. In Mexico, the Mining Development Plan encourages the development of suppliers through the Mining Development Guarantee (FIFOMI), which provides financing, training and technical assistance. In Chile, the World Class Suppliers Program was created, based on an initial private project by BHP Billiton, which was later joined by CODELCO33 and the Chile Foundation. This program aims to develop knowledge-intensive suppliers and technological solutions that can be scaled in other sectors and markets. In 2009, Vale launched a specific program for the development of suppliers for its operations in Brazil (Inove), with financing tools, training and creation of business rounds. The program is primarily aimed at SMEs and is implemented in collaboration with local credit, training and business associations, including the Brazilian Micro and Small Business Support Service (SEBRAE). In recent years, some countries have tried to establish mandatory local content objectives, such as in Brazil. In 2013, in this country, a bill was proposed to apply these objectives in extractive industries (finally not approved), following policies in force in the oil sector since 1999.
Innovation	In 2009, the Advanced Technology Centre for Mining was created in Chile, which includes representatives of the academy and the business sector. The Centre has public and private support to develop innovative projects. In Mexico, FIFOMI provides financing for projects to develop new technologies for the mine, including environmental preservation objectives. In Brazil, with the participation of the Studies and Projects Financier (FINEP) and BNDES, the Inova Mineral program was launched, which is aimed at the development of technologies in the mineral value chains defined as "carriers of the future" (cobalt, graphite, lithium, molybdenum, platinum group metals, niobium, rare earths) and minerals in which the country has a high deficit (phosphate and potassium) and minimising the environmental impact of mining operations (there is a similar programme for the oil sector, Inova Petróleo). Chile is implementing a strategy to improve its positioning in copper refining and casting, with the aim of increasing efficiency, reducing environmental impact and improving working conditions through technological development projects.
Industrialization	The Mining Corporation of Bolivia (COMIBOL) – the public company in charge of managing the mining production chain in the country – has made strong investments to consolidate the mining-metallurgical chain through the nationalization and modernization of a tin industry and the start-up of a of lead-silver smelting complex that has remained inactive for the past 30 years. In addition, the lithium exploration project in the Salar de Uyuni seeks to develop the entire value chain up to the manufacture of lithium-ion batteries.

Source: Own preparation based on ECLAC (2016).

2.3. Benefit Sharing Engines - The Social License to Operate (LSO) and Corporate Social Responsibility (CSR)

In recent years, extractive industries have experienced important changes due to social changes, market demands, and the positioning of companies in the sector. In the current context, compliance with legal and environmental requirements is insufficient to satisfy society's requirements, market standards and internal protocols in companies. Currently, extractive companies are aware of the impacts their operations have on local communities and have a greater willingness to adjust the development of their projects to the requirements of communities, as well as to ensure that their activities contribute to local development.

The *stakeholders* of the extractive industries demand that companies are aligned with the principles of sustainable development, that they strengthen their involvement with the community, through projects and programs, and that they increase their participation in decision-making processes. Companies are increasingly committed to meeting these requirements, as the viability and image of the sector are greatly conditioned by this new approach (IIED and WBCSD, 2002).

Public participation and the empowerment of local communities in decision-making processes are fundamental principles of sustainable development approaches. The rationality that is under the inclusion of the community in the processes of participation and action is that public participation contributes to social learning and the socialization of decision-making and to the enrichment of the corresponding processes. The new requirements to which extractive companies are submitted and their repositioning are translated into new commitments that are based on two concepts: the Social License to Operate (LSO) and Corporate Social Responsibility (CSR).

The Social License to Operate, which is an exclusive concept of extractive industries, refers to a kind of social license that local communities give to mining companies[37]. This licence allows companies to avoid potential conflicts, which normally come at a high cost, and to reduce their exposure to social risks (Bridge, 2004), as well as to increase the legitimacy of their operations (Owen and Kemp, 2013). LSO is negotiated and granted in the pre-production phases and therefore has an *ex-ante* character. Corporate Social Responsibility, which is a much more comprehensive concept than LSO, is the commitment of companies to society, materialized in terms of their contribution to the well-being of the communities in which they operate. CSR develops especially during the production and post-production phases, that is, it has an *on-going* and *ex-post* character.

The Social License to Operate is one of the main challenges that extractive companies face today (Ernest and Young, 2011). An extractive project has LSO when it has approval and acceptance by the society where it will develop its activities (Thompson and Boutilier, 2011). This licence is intended to meet the expectations of society and at the same time limits the activities that that society considers unacceptable, from different points of view.

[37] This concept was first introduced by Jim Cooney, Director of International and Public Affairs at Placer Dome, at a World Bank conference in 1997.

Although the Social License to Operate can have expression in several areas, the local community is usually a key player in these processes, due to its proximity to projects, sensitivity to its potential effects, and the ability to impact on the development and performance of projects. This ability to "grant" or "not grant" this LSO makes local communities very influential actors in the processes of extractive project development as well as in their governance. In general, obtaining LSO from the local community implies that the company initiates communication in a timely manner and maintains it on a permanent basis, providing information in a transparent manner, establishing conflict resolution protocols and defining decision-making mechanisms culturally adapted to the local reality (Social License Task Group, 2010).

Thompson and Boutilier (2011) identify three normative components of the Social License to Operate – legitimacy, credibility and trust – and four levels of social license – denial, acceptance, approval and identification with the project (psychologically). Advancing from a state of legitimacy to a state of trust, through credibility, is a process of construction and balancing of social capital in the relationship between the company and local stakeholders. Companies have to understand how best to participate in the type of community partnerships that allow them to acquire LSO, and communities that are willing to accept projects from extractive industries have to develop social structures with the capacity to issue an SLO that gives legitimacy, credibility and trust to the project and the relationship between the parties.

In general, Corporate Social Responsibility can be defined as the obliging actions or expectations about an organization in relation to the activities it carries out for the benefit of society as a whole. This responsibility can be passive, by avoiding carrying out socially undesirable activities, or active, when developing activities aimed at achieving social objectives.

There is no single meaning of the term Corporate Social Responsibility, however the generality of the definitions contain several dimensions: social (relations between companies and society), environmental (natural environment), economic (socio-economic and financial), voluntary (actions not prescribed by law) and partnership (stakeholders or groups of stakeholders) (Dahlsrud, 2008). In recent years, the CSR has incorporated new aspects to accommodate changes in social expectations, especially in developed countries.

In recent years, the mining sector has been developing standards with the principles of sustainable development (International Council on Mining and Metals, 2016). As a result of these advances, the CSR programs of extractive companies in different countries have an increasing level of sophistication and include projects focused on the company's relationship with the local community and stakeholders (Lacey and Lamont, 2014).

In the field of extractive industries, the main aspiration in the field of CSR is to leave a positive and lasting legacy for the local communities. Fordham *et al.* (2017) refer to this legacy as the Enduring Value to the Community (EVC). [38] This Enduring Value for the Community is a central element of the CSR of extractive companies, by serving as a basis for generating commitment and articulating forms of cooperation with local communities and the various

[38] *Enduring Community Value*.

stakeholders of these projects. For employees of extractive companies, EVC is a necessary tool to deal with the complexities of CSR within the local community.

In the context of The Sustainable Value for the Community, extractive companies must strike a balance between the economic, environmental, and social dimensions throughout the life cycle of projects. EVC requires companies to connect with local values and aspirations to ensure that programs are relevant and have long-term value (Gilberthorpe and Banks, 2012). Consequently, while *top-down* policies, such as company programs or public policies, are key to raising the EVC, local grassroots activities and the participation and involvement of the local community are crucial to ensuring positive impacts over long time frames.

In general, extractive companies in operations in developing countries do not generate value for communities in the long term through their CSR programs (Essah and Andrews, 2016; Gilberthorpe and Banks, 2012). Conversely, in developed countries such as Australia or Canada, CSR programs are focused on producing impacts and generating value in the medium and long term. In these countries, CSR programs geared towards EVC generation aim to ensure LSO throughout the project life cycle and respect regulatory enforcement frameworks in the social and environmental fields.

Measures to obtain LSO and CSR programmes from extractive companies are embodied through benefit-sharing mechanisms and programmes. In this context, the benefits generated by mining projects are distributed among the company, the community and the local government and other relevant stakeholders.

2.4. Benefit sharing mechanisms - Review of relevant models

Benefit sharing can be defined as the mechanism that identifies and determines the monetary or non-monetary results of an extractive project and ensures that they are fairly distributed among stakeholders involved and affected (O'Faircheallaigh, 2013). The purpose of the sharing mechanisms is to ensure that a significant part of the economic benefits are in the region where income is generated.

Benefit sharing mechanisms can be classified according to their origin, scope and form. Benefits may be classified according to their origin: (i) those corresponding to legal obligations for extractive companies; and, ii) those granted by companies under their Social License to Operate and Corporate Social Responsibility (Godden *et al.* , 2008; Söderholm and Svahn, 2015). Given their scope they can be classified as monetary, such as development and investment funds, share sharing and tax sharing, or non-monetary, such as infrastructure investment, initiatives to improve access to services, provision of educational equipment and medical equipment, local job creation, training for workers and local contracting of services (Ramdoo, 2016).

Benefit sharing strategies adopt a number of formulations, as there are no guidelines determining the amounts and how to share the benefits with the community (Prno, 2013 and Tysiachniouk, *et al*., 2018). The absence or failure to create benefit-sharing agreements can create conflicts and even withdraw The LSO from extractive companies (Söderholm and Svahn, 2015).

In developed countries with mineral resources and thriving extractive industries there are well-defined benefit sharing agreements. In recent years, in Australia, the development and implementation of tripartite agreements between governments, extractive companies and local communities and the corresponding benefit-sharing mechanisms has become common practice (O'Faircheallaigh, 2013; Söderholm and Svahn, 2015). In Canada, the implementation of tripartite agreements is a common practice for community development and benefit sharing. Benefit sharing agreements include in addition to the distribution of royalties and the realization of direct payments, job creation and the hiring of services at local level, as well as the training of workers on the same scale (Ramdoo, 2016). When properly designed and implemented, these agreements promote the sustainability of the extractive industry and the development of the territories in which they are inserted (Sarkar *et al*., 2012; Ramdoo, 2016).

Community benefit sharing can be formalised through political agreements and legal reforms. The proportion of benefits allocated to the community should be determined and included in the initial agreements between governments and extractive companies. In cases where the government has little experience or capacity to articulate benefit-sharing protocols, a collaborative approach should be adopted. In the long term, local government training must be ensured so that it can take responsibility for the distribution of benefits to the community through the different instruments available.

Additionally, in many countries, the taxes and duties generated by the exploitation of natural resources were state-wide and were collected centrally. Some of these revenues came back to the local community through budget transfers. Another was applied in the other

territories of the country so that they could benefit from the income generated by extractive activities.

In many countries this situation has changed in recent times, thanks to the formalisation of revenue-sharing agreements, which usually include communities and local and regional authorities. This new approach has resulted in changes in national policies and laws, both in developed countries (e.g. Canada) and in developing countries (Bolivia, Colombia, Indonesia and the Philippines, among others).

Currently the benefit-sharing formulas are very diverse (see Box III, Box IV, Box V and Box VI on the situation in Australia, Canada, Chile and Alaska, respectively, at the end of the section). In many cases they include the assignment of part of the taxes to the local governments, the possibility of establishing local taxes on extractive activity and the donation of a percentage of their operating costs, revenues or profits to local communities (based on a development plan). In some cases, the relevance of the measures, the fragility of local governments, the lack of institutional capacity and transparency and bureaucracy have hindered their implementation and limited their efficiency[38].

A matter of great importance in this area is how to share the benefits within the community. Social and economic influences can generate strong imbalances within communities and between different communities. In order to avoid the resulting of winners and losers from these processes, simplification mechanisms and, in some cases, compensation mechanisms should be introduced.

Although in some regions there are cash payments to community members, in most cases the benefits are channelled through investment vehicles and carrying out activities or service provision. When there are cash payments, if the amounts are relatively small, they tend to be spent quickly and, to a significant extent, outside the territory that is intended to be developed.

Incorporating extractive industries into local and regional development plans can allow benefits to remain over time while ensuring higher levels of diversification of the local economic structure. These plans should be constructed on the basis of participatory methodologies and with the leadership of the government (preferably local or regional) or an external entity (namely a university). Plans should have associated monitoring and evaluation tools.

These initiatives to ensure a more equitable distribution of the benefits of extractive industries are, among others, justified by the following reasons (World Bank, 2010):

i. The growing concern about the environmental impacts of large-scale extractive industry projects, which are especially relevant at local level;
ii. The increased pressure on extractive companies to contribute socially and economically to local communities, and to involve the local population in decision-making processes.
iii. The greater ease of communication, which has promoted the sharing of experiences between mining communities in various locations;

[39] These situations are common in countries such as Peru or South Africa.

iv. The high prices of some ores since the early 2000s, which have increased the profits of extractive companies and, at the same time, evidenced the lack of re-activity for regional economies in general and for local communities in particular.

There are several models for sharing monetary benefits between the extractive company and the community. The main models used in extractive industries are (i) a one-off payment at the outset; (ii) fixed annual payments; iii) output-based royalties; iv) royalties based on the output value; v) profit-based royalties; and, vi) shareholder participation.

The non-adoption of benefit strategies can lead to disruptive social tensions, which may jeopardize the business of extractive companies, in particular due to contract breaks and business losses[40]. On the one hand, whether social tensions affect the reliability of mineral suppliers by customers and, consequently, hinder the management of the extended value chain. On the other hand, if the conflict negatively impacts the company's image, given that currently customers, banking, funds and other stakeholders make purchasing and financing decisions according to the product or the final result, but also depending on the characteristics of the production process and the management approach of extractive companies.

Benefit sharing strategies fall within the sustainable mining model. This model, which involves the involvement of communities, governments, and companies, has as main objectives (Eggert, 2001):

i. Enhance the links between the activity with the local reality;
ii. Increase compensation for social and environmental costs borne by mining regions;
iii. Increase the involvement of local communities in decision-making processes;
iv. Improve environmental and landscape repair interventions after the cessation of extractive activity;
v. Improve benefit sharing processes;

The sustainable mining model allows the transfer of power and responsibility to the regional and local scale and, at the same time, to put pressure on the central government to share its tax revenues from extractive activity with regional and local governments. In recent years this model has been adopted in several countries, both developed and developing, forcing the development of Corporate Social Responsibility of extractive companies and the implementation of instruments and programs for sharing benefits.

These strategies are a way of ensuring the granting of a Social License to Operate to extractive companies, especially at the local level. Community Development Funds, financed with revenue from extractive activities, are one of the most widely used mechanisms to share the benefits generated by extractive industries (Söderholm and Svahn, 2015).

[40] According to *Ernest & Young Global Mining and Metals Centre* (2012), the lack of benefit distribution activities is one of the 10 most relevant business risks for the mining industry on a global scale.

***Box III* - Benefit Sharing in Australia**

- Extra-state revenues - Royalties based essentially on production;
- Basic legislation - *Land Rights Act*;
- In Aboriginal land projects, benefit-sharing agreements are the so-called *Indigenous Land Use Agreements* (ILUAs), which regulate compensation to indigenous landowners by extractive companies;
- The legislation establishes a financial regime that allows the Aboriginal population to receive a share of the royalties;
- Governance system based on so-called *Land Councils;*
- *Land Councils* have veto power and extractive companies have to negotiate with local landlords;
- Agreements with divergent results.
- In general, in the case of older ones:
  - Lack of clear definition of policies to be implemented and sparsely transparent practices;
  - Complex structure, high transaction costs, poor financial reporting and lack of institutional oversight;
  - Poor consistency in the provision of services to the local population, in particular in terms of quality and stability;
  - Modest impacts in terms of long-term economic development.
- In general, in the case of the most recent:
  - Greater clarity in prioritisation;
  - Resources primarily aimed at supporting education and training, improving health services, promoting the economic independence of the local population, developing the institutional framework and culture and financing community initiatives;
  - Extending these agreements to other areas, including the construction of institutional and Community capacity at local level and business development;
  - Greater diversity of incomes and better opportunities to promote the development of local communities;
  - Significant impacts in terms of regional development.
- Existence of tensions derived from the distribution of royalties between the federal government and the mining states of the west of the country;
- Existence of reinvestment programs of royalties in the region / state, focused on long-term projects, especially on the development of infrastructure.

Source: Based on Söderholm and Svahn (2015).

***Box IV* - Benefit Sharing in Canada**

- Extra-state revenues - Taxes and royalties introduced by the provinces (usually taxes on the profits of the activity);
- In addition to the payment of taxes and royalties, extractive companies have been promoting development agreements for local communities since the 1980s;
- In the last four decades more than 150 such agreements have been signed in the country;
- The agreements have contributed to retaining benefits in the *hinterland* of projects, by strengthening links with the economy and businesses of the region, and to ensuring the involvement of the local population, in particular the indigenous population;
- The basis of these agreements is the so-called tripartite process, in which communities, businesses and governments analyze the project and distribute responsibilities, costs and benefits;
- The regulatory framework of these agreements usually includes a royalty contract, a labour market plan, a procurement plan, a regional development plan and aspects related to communication and taxation;
- The *ex-post* evaluation of some large projects confirms that these agreements have had a considerable impact in terms of economic development (employment, wages, income and educational level, among others), local-scale procurement and sectoral diversification of the economy on the same scale. The impacts in terms of local development are less obvious;
- Since the early 2000s, the boom in the mining industry and the increase in the potential for profits for companies put enormous social pressure on provincial governments to make these development agreements compulsory;
- There are new regimes with a wider spectrum in some provinces. For example, in Quebec:
    - Extractive companies are obliged to pay a flat tax and a progressive tax on profits within the regional;
    - Tax rates can be eased if companies invest in the processing of ores in the region.

Source: Based on Söderholm and Svahn (2015).

***Box V* - Benefit Sharing in Chile**

- The impact of extractive industry in some regions, notably Antofagasta, has been very positive, especially in terms of economic growth (higher than the country average), increased income and poverty reduction, as well as in terms of sectoral diversification and export structure;
- Extractive companies pay an annual fee for the mining rights they have allocated and their revenues are distributed between the municipalities of the region and the *National Regional Development Fund* (FNDR);
- The FNDR finances projects to promote regional development;
- The role of the fund has been increasing over time and in regions such as Antofagasta it accounts for 40% of the public resources invested in its territory;
- In this region, a significant number of extractive companies have adopted plans to ensure that the benefits of their activity have a positive impact on local communities;
- Some initiatives in this region, such as the *Escondida Foundation,* aim to empower people and communities through programs to improve education, strengthen civil society and build capacity in the field of production. Other priority areas are local hiring, relationship with universities and entrepreneurship;
- These programmes are implemented through alliances with public and private organisations to ensure the involvement and co-financing of development projects;
- In recent years the Chilean government has actively promoted, together with the extractive industry, the development of companies supplying goods and services for mining, with a special emphasis on innovation and research. In 2009, in the Antofagasta region, a public-private collaboration began between extractive companies, the Ministry of Mines and several suppliers from within the region began
- The ultimate objective of this collaborative programme is to develop upstream and downstream links for extractive industries in the region to increase added value and, at the same time, the productivity of large operators in the sector;
- The first evaluations of the programme are generally positive for their contribution to growth and exports and to environmental improvement and working conditions and safety in the sector.

Source: Based on Söderholm and Svahn (2015).

***Box VI* - Sharing Benefits in Alaska**

- Contrary to what happens in the oil extraction sector, where the *Alaska Permanent Fund* exists, fueled by royalties paid to the state government, in the extractive industries sector there is no such comprehensive benefit-sharing instrument;
- The main mechanism for sharing benefits is bilateral agreements, which regulate the use of the royalties of extractive industries for specific uses;
- These long-term agreements are cooperative; in most cases, regulate the allocation of royalties to local communities in general and landowners in particular;
- In general, in these agreements there is no state intervention; the agreement is established between the extractive company and the local community;
- The resources allocated to these agreements are dedicated to financing education, essential services and priority construction projects, as well as job creation and business opportunities;
- The *Alaska Minerals Commission* recently proposed a reform of state tax policy that would allow a portion of the tax revenue stemming from the state mining license fee to be returned to communities affected by the extractive projects;
- This reform would prevent local governments from being forced to introduce taxes on mining activities and would ensure greater fiscal stability for extractive companies.

Source: Based on Söderholm and Svahn (2015).

According to the review (see Box III to Box VI), there appear to be a set of best practices to follow on benefit-sharing policies and agreements, notably (Söderholm and Svahn, 2015):

i. Clearly define the beneficiary groups in order to avoid conflicts and controversies;

ii. Focus on long-term economic commitments, for which capacity building initiatives should be developed, which feed development processes after the closure of extractive activity;

iii. Establish rules (and the corresponding sanctions) that define the policy of using the resources allocated to the agreement in order to avoid waste;

iv. Avoid approaches based on the direct subsidy of certain groups and develop more comprehensive and inclusive approaches;

v. Integrating companies, the community and governments into agreements often leads to more efficient results, with higher levels of legitimacy and commitment;

vi. Promote the development of industrial *clusters* related to extractive activity, through programs to attract investment and foster entrepreneurship.

2.5. Implementing benefit sharing - Community Development Funds [41]

In recent decades, extractive companies, in different latitudes, have created programs to ensure that communities receive part of the profits from mineral exploration. These programmes are, on occasion, a response to the discontent of affected communities or to criticism from associations or NGOs, but in others they arise as an active initiative of the extractive companies themselves (World Bank, 2010a).

The basis for the establishment of these local Community Development Funds (FDC) is the national Natural Resources Funds (FRN). Its main purpose is to manage adequate income generated by natural resources and put them at the service of economic development. Resource-rich countries have created funds for stabilization and savings and investment. The creation of these funds is perceived as an effective strategy to combat the curse of resources (Davis *et* al., 2003).

FRNs are financed with a share of the revenue from natural resources. The main objectives of these funds are to facilitate the accumulation of temporary and relatively volatile revenues, stabilise public finances and finance public expenditure when revenue from natural resources decreases or even disappears (Humphreys and Sandbu 2007). FRNs have had diametrically different performance levels (Fasano, 2000). Norway's fund is pointed out to be a hugely successful case while Chad's has proved to be a complete disaster (Paler, 2011). The failure of some of these initiatives is related to the lack of adaptation to national realities and the conflicts between political incentives (short-term) and economic development objectives (long-term).

Sharing the benefits of mining projects at the local level is considered a necessity and in some countries it is currently a legal requirement. In addition to environmental issues, social aspects and their financial impacts should be taken into account from the first stages of planning an extractive project. Community development agreements (ADC) in the mining sector contribute to reducing social tensions related to the extraction process and allow local communities to benefit from the extraction of natural resources in their territory (World Bank, 2010a).

Controls on local sharing of benefits exercised by the central government vary widely; in some cases they do not exist, but in others they are very strict (World Bank, 2010a). In some circumstances, extractive companies celebrate ADC directly with communities and local governments, with little or no central government participation. In other cases, the central government redistributes part of the taxes and royalties it collects from the extractive company, and revenue investment is largely managed on a local scale. In intermediate solutions, the central government has regulatory functions, in which it establishes and applies procedures to ensure the most appropriate selection, implementation and evaluation of Community investment projects financed, in whole or in part, by the revenue stemming from the resources.

[41] That section is largely based on a number of World Bank documents.

The most commonly used instrument for managing the financial resources resulting from benefit sharing is the FDC[42], to which some or all of these resources are allocated (Söderholm and Svahn, 2015). The main objective of the fund is to make permanent the wealth created by the project and, therefore, to have a source of financial resources to support regional development in the future. These mechanisms ensure that communities benefit during and after the life of the project.

In the context of Community development agreements, most companies prefer to use FDC (World Bank, 2011a). This preference for the FDC has its origin in the bad experiences with other models associated with ADC, namely direct payments, since on many occasions the resources diverted did not reach the final beneficiaries.

Currently, FDC are considered, within the scope of The ADC and, therefore, benefit sharing mechanisms, as the best practice on an international scale (International Financial Corporation, 2015). In most cases, FDC funds depend on the resources allocated by the companies, but there are success stories in which they have managed to generate interest among external funders.

From the companies' perspective, the FDC have a double advantage: i) separate the legal responsibility of community development projects from the legal responsibility of the company; and, ii) allow the implementation of multi-annual development projects, avoiding their exposure to the company's budget cycles and commodity price fluctuations (Lounsbery, 2011). The FDC can be financed directly by the extractive company or through the proceeds from the taxes on minerals (transferred by the central government), or through a combination of both options. The collection of revenue stemming from the exploitation of resources depends to a large extent on the typology and scope of taxes on extractive activity and on the participation in revenues at the local level.

In Chile and South Africa extractive companies are required by law to allocate a given percentage of production or profits to community development, usually through FDC. In Canada, corporate contributions to the FDC are considered good practice, particularly in regions where there are indigenous communities, however they cannot be formally required. In Peru, royalties and taxes on resources are collected at the state level and, subsequently channelled through local governments for community development in the municipalities of Minas Gerais. Other countries collect royalties and taxes on resources at regional or local level, part of which may be intended to fund the FDC. Most of the countries where FDC exist exempt the funds from paying taxes, since the goods and services financed by them are, to a large extent, public goods.

Corporate contributions to the FDC may be based on a percentage of production or profits (Banco Mundial, 2011). Local communities and governments often prefer production-based contributions because they ensure an independent financial contribution from corporate profits, while companies prefer to define these

[42] Also called Mining Funds or Mining Development Funds or even Resource Funds.

contributions as a percentage of profits or operating expenses or capital expenditure or based on an annual estimate of the company's financing availability (McElroy, C., 2012). The advantage of using production and revenue as the basis of contributions is that they are relatively easy to verify.

Funds managed by the FDC should be used in improving services or in alternative programmes to existing ones (World Bank, 2010b). The focus should be made to harmonise interventions financed by the FDC with publicly funded initiatives, avoiding overlaps and promoting complementary measures. The functions of the fund and local government should be clearly defined to avoid redundancies and seek synergies. In order to improve the effectiveness of FDC-funded interventions, the fund's budgetary management and expenditure should be linked to the local and regional development plans that are in place at all times.

Although there are some cases where national governments participate in the FDC, it is generally considered that they should remain on the sidelines (World Bank, 2010b). The main role against the participation of national governments in the funds is that they are the regulators of the funds and therefore cannot assume both the functions of regulator and regulated. Nevertheless, the participation of national governments in the funds is sometimes justified by the lack of capacity and skills at local level.

In general, the most successful ADCs are those in which governments, extractive companies and other qualified stakeholders at the local level invested significantly to strengthen capacity before the start of the Implementation of the ADC. The strengthening of capacities and competences not only covers local government, it also includes local organizations of diverse nature, as well as other local groups of interest. Capacity building is largely aimed at improving strategic thinking and priority-setting processes, but also at the acquisition of skills in more operational matters, such as the preparation of budget forecasts and cost analysis, the preparation of accounting states and the presentation of financial reports, the execution and management of projects and the carrying out of monitoring activities and evaluation.

Some of the international good practices related to the creation of FDC and even tax incentive programs are as follows (World Bank, 2011):

i. Companies should ensure that their financial contributions to the FDC are transparent and fixed. Ideally this funding should be independent of the payment of taxes;
ii. FDCs should be managed by an independent structure to ensure competence, trust and institutional participation. They shall be supervised by a board of directors representing the different interest groups.;
iii. Community participation in decision-making during all stages of the project is fundamental to the success of these mechanisms.

According to World Bank (2010b), best practices on the use of FDC in extractive industries are, among others:

i. The clear definition of a strategic vision, defining the role of the fund as a development agent at the local level;
ii. A unique and well-defined purpose;
iii. A governance model with representative multi-agent governance that ensures community participation;
iv. High levels of co-financing and collaboration, ensuring that the company's contribution is transparent and stable;
v. the incorporation of transparent practices and accountability, including information on the use of receivables;
vi. If necessary, limit expenditure, preventing it from exceeding the capacity of the local economy to absorb it productively;
vii. flexibility to adapt interventions to changes in development guidelines and operational conditions;
viii. The design of tax regimes that allow the local government to capture a part of the income from the extraction of the mineral without discouraging investment.

FDCs should be managed by an independent structure to ensure competence, trust and institutional participation. They should be supervised by a board of directors representing the different interest groups. Revenue stemming from funds should be invested appropriately, with a long-term perspective, minimising resource consumption in recurring activities. This implies that resources are used, for example, to improve the allocation of public infrastructure and health and education equipment and programmes as a way to strengthen the foundations for the future development of the territory.

Additionally, the greater the dependence of a given region on extractive industries, the greater the need to make investments, with the support of the FDC, which promote sectoral diversification. However, in relation to these processes, it is appropriate that they are led by local entrepreneurs or investors from outside the region and not by the government. Its role in this case should be limited to promoting investments in human capital and infrastructure and the development of support services at local level.

These funds are also an opportunity to save resources for future uses (World Bank, 2010a). In certain contexts this issue can be of great importance, particularly if the capacity to absorb resources by the local community in the short term is limited. Local governments (and the FDC) that increase investments by leveraging additional resources resulting from rising mineral prices are likely to rapidly deplete their portfolio of high-return projects. The re-interest in extractive project revenues can also lead to power struggles and political instability, which in turn may result in less investment to leverage local development.

As mentioned, decisions on the distribution of revenues from funds should be carried out through participatory structures, which include representatives of the various interest groups associated with the exploration project – the company, governments and representatives of the

Community. These structures, which can take the form of development fora, improve participation levels, increase the legitimacy of decisions and reinforce the degree of acceptance of extractive industry projects. However, in reality, these participation schemes are not without problems, notably by (World Bank, 2011):

i. Lack of participatory culture in decision-making;
ii. Absence of participatory policies in areas related to extractive projects;
iii. Preponderance of economic factors over social and environmental factors in decision-making;
iv. Information deficits and timing mismatch;
v. Mastery of reactive approaches over proactive approaches;
vi. Existence of strong power asymmetries;
vii. Reduces levels of trust between actors;
viii. On occasions, the creation of barriers by the central government;
ix. Lack of political will and scarcity of motivation among the various actors;
x. Lack of mechanisms to manage conflicts;
xi. Lack of motivation and commitment from the actors;
xii. Excessive protagonism and a deficit of leadership;
xiii. Doubts about the representativeness of the actors;
xiv. Uncertainty about the company's capacity and the feasibility of the project;
xv. Lack of credibility of political actors;
xvi. Little experience in assessing social impacts.

Chapter III. The economic impacts of the Mina do Barroso Project

III. The Economic Impacts of the Mina do Barroso Project

3.1. Framework and methodology

Extractive projects can generate significant economic benefits for the community where they are inserted. There are several methodologies for quantifying these impacts, namely in terms of gross output, added value, employment and tax revenues, with the input-output methodology being one of the most used and referenced in the literature[43].

The input-output[44] (I-O) methodology is very suitable for measuring short-term effects of investment projects. Its tactical character, however, does not allow it to capture the long-lasting effects in the medium and long term linked to the investment under analysis. In summary, this methodology consists of a set of techniques that have as main objective the characterization of the productive structure of a given economy, based on the relations between the various sectors or branches of activity. From an analytical point of view, its interest derives from the possibilities it offers as a method of assessing and forecasting sectoral and macroeconomic institutions, in the context of public policy interventions and large-scale private investments[45]. Examples of the use of this methodology in the evaluation of investment programs can be found in Beutel (2002), where the net impacts and effects of the main programmes financed by the Structural Funds in Objective 1 countries and regions in the period 2000-2006, or in Dias and Lopes (2011), are based on a study impact of the National Strategic Reference Framework ('NSRF') on the Portuguese economy in the period 2007-2013. More recently, and for the Portuguese case, the input-output methodology was used to evaluate the economic impacts associated with the European Capital of Culture, Guimarães 2012 (Castro *et* al., 2013), following the methodology used in Herrero *et al*. (2006) on the European Capital of Culture, Salamanca 2002.

The I-O matrices used in this evaluation come from the I-O matrix system for the Portuguese economy, for the year 2015, published together with the national accounts (INE, 2018). These matrices have a breakdown of the economy into 82 types of products. Based on this system of matrices it is possible to build a model of determination of supply from the final demand, in which the components of the latter are exogenous, except, or not, private consumption. It is, therefore, the shocks directed at each of the components of the final demand that determine the level of activity in the short and medium term.

In short, the main assumptions of the model used are as follows:

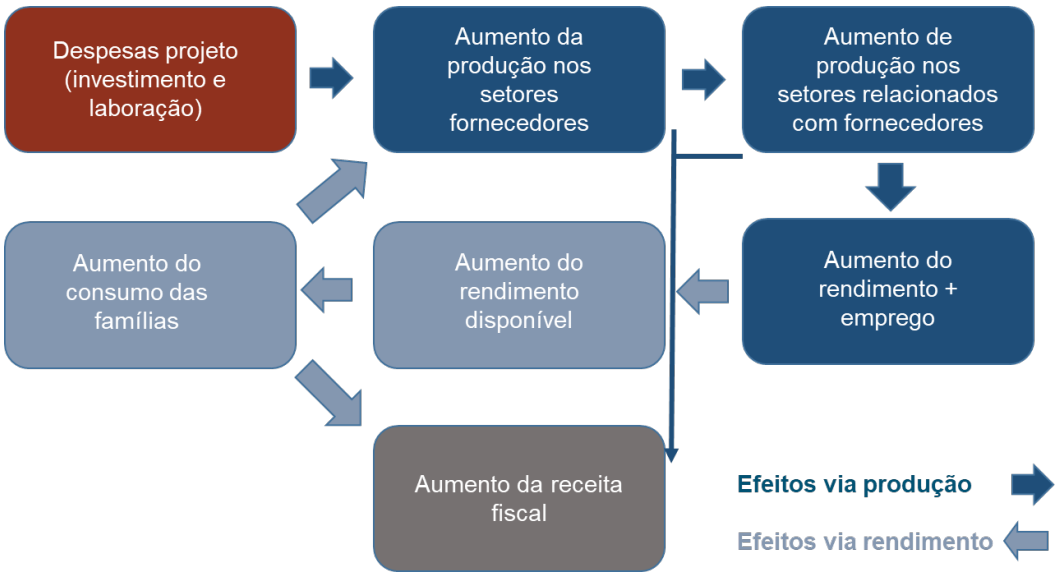
1. The production and imports of goods from each branch are determined from their final demand, using matrices of technical coefficients broken down into national production coefficients. Each component of the final demand is divided into 82 products (corresponding to the branches considered in the model) and, for each product, into three parcels: along with which it is satisfied by national production, at basic prices; the corresponding part of imported products (at CIF – *Cost, Insurance and Freight* prices); and the portion corresponding to net taxes of subsidies on the products.

[43] For a study on the effects of the local supply chain on the regional impacts of a mining venture in Missouri (USA), see Xing, et. al. (2017).
[44] First introduced by Leontieff (1936).
[45] For a review, see, for example, ten Raa (2006) or Ramos and Sargento (2011).

2. Household consumption is broken down into endogenous consumption and exogenous consumption. The endogenous part corresponds to consumption derived from income distributed to households through income from work and income from property (gross operating surplus) of national origin.

Schematically, the model can be represented as follows:

Figure 3.1 - Economic Impact Assessment Model (I-O)



Source: Own elaboration

The increases in demand in a given product j (e.g. expenditure on goods and services associated with the initial investment in the Mina do Barroso project) have a direct effect on the production of that product, and an indirect effect on the amount produced of inputs to meet the demand for the product j and on tax revenues in terms of taxes products and production. The resulting increases in production lead to an increase in income and employment, resulting in an increase in the disposable income of individuals and tax revenue. Once a tendency towards constant consumption is assumed, the increase in disposable income leads to an increase in consumption, which, to be satisfied, again induces an increase in national production, employment and tax revenues (induced effects, via consumption, of income on production). In this study, consumption is considered to be exogenous, that is, the effects via income will not be accounted for. Additionally, since it is a company of mostly foreign capital, the income associated with the remuneration of the capital (gross operating surplus) will also not be considered in the model. Thus, the estimated impacts can be understood as the lower limit of the value of the total impacts.

3.2. Multipliers

A production multiplier for a given sector j is defined as the total value of production generated in all sectors of the economy, whatever its position in the production chain, necessary to satisfy an additional production unit of sector j destined for final demand. If we represent the elements of the inverse matrix of Leontieff[46] by $o_{ij,}$ then the multiplier of the production of j, O_j, corresponds to the sum, in column, of the values o_{ij} $(O_j=\Sigma_i o_{ij})$.

One of the advantages of the I-O methodology is to allow the calculation of multipliers for aggregates other than production. Assuming that the weight of gross added value in the production of each branch remains constant, it is possible to estimate the direct and indirect effects on the country's income, derived from a given investment. Using a similar approach to indirect taxes net of subsidies, in which VAT represents the largest share, we can also assess the impacts of the Mina do Barroso project on revenue fiscal tax. It should be noted that this methodology infers the effects derived from changes in demand, assuming that the parameters of supply (i.e. productivity and relative weight of the various inputs) remain constant.

Likewise, assuming that labor productivity remains constant, that is, that the number of workers required to produce one unit of product in each branch does not change, it is possible to calculate job multipliers, with their value interpreted as the number of jobs in the economy (of annual duration) created by each monetary unit of value added generated in branch j.

Briefly, the calculations performed are based on the following formula:

$Z^{VAB,T,E}=B^{VAB,T,E}(I-A)^{-1}$, in which:

$Z^{VAB,T,E}$, corresponds to the vector of value added multipliers (Z^{VAB}), net taxes on subsidies (Z^{T}) and employment (Z^{E}) $B^{VAB,T,E}$ corresponds to the vector of the relative weights of each of the previous aggregates in production, and their requirements, in terms of jobs (B^{E}).

Table 3.1 shows the multipliers of production, added value and employment for each of the main branches of activity directly impacted by the Mina do Barroso project. The values listed are in line with those reported in other studies[47].

In this exercise, the multipliers do not consider the induced effects derived from consumption expenditures by households or the possible reinvestment of capital income generated in the meantime. For example, considering expenditure on the construction of buildings, for every million euros spent on this class of products, the gross output at national level increases by EUR 1.848 million, the added value by EUR 0.731 million (contribution to GDP c.f.) and employment in almost 50 jobs of equivalent annual duration.

[46] Leontieff's inverse matrix is equal $(I-A)^{-1}$, in which A represents the matrix of technical coefficients. These indicate the proportion of factor i required for the production of a product unit j. For this study, the multipliers contained in Table C.6.6.11 of the National Base Accounts 2016 (SEC2010) were considered.

[47] For example, Dias and Lopes (2011) report a multiplier of 1.34 in the endorsement of the impact of the NSRF on GDP in 2008 and 2009.

Table 3.1 - Multipliers of Production, Added Value and Employment of the Main Branches of Activity Affected

	Branch of activity	Multipliers		
		Product	Added Value	Equivalent annual employment per million VAB
19	Coke, refined petroleum products and fuel agglomerates	1.186	0.123	3.382
28	Machinery and equipment, n.e.s.	1.479	0.514	25.868
41	Construction of buildings	1.848	0.731	49.984
43	Specialized construction work	1.767	0.731	53.125
49	Ground and pipeline services	1.723	0.720	31.776
50	Water transport services	2.084	0.750	17.174
97	Services of families employing domestic staff	1.000	1.000	71.077

Source: Own Elaboration.

3.3. Assumptions

Table 3.2 presents the assumptions considered in this study. The data were based on the information contained in the "Scoping Study for the Mina do Barroso Lithium Project", and on the most recent information provided by the project promoter. An exchange rate of EUR 1 = 1.1 USD was considered. Year 1 corresponds to the investment year and years 2 to 12 to the working period. In the latter period, the average values per item are indicated.

Table 3.2 - Assumptions Made for Investment-Related Spend, €M

Activity	Year 1	Year 2-12 (Annual average)	Direct impact (Affected sectors)
Investment	98.91	2.49	Suppliers of equipment, construction, engineering services and mechanical services
Operating Expenses			
Salaries (119 workers)		4.55	Employees
Land movement		22.84	Suppliers of equipment, construction, engineering services and mechanical services
Fuels and reagents		13.70	Fuel distributors
Freight			
Transport		6.65	Carriers
Shipment for export		5.99	Freight forwarders and international maritime transport
Royalties		3.60	Central State and Municipality
Taxes on profits		15.98	Central State and Municipality

Source: Savannah (2018).

3.4. Direct and indirect impacts and exports

Considering the multiplier effects and the amounts of expenditure on investment, operation and freight, described above, and adjusting the values of the multipliers to the type of expenditure to be made, the assumptions for calculating the impacts are those listed in Table 3.3.

Table 3.3 - Direct Impacts and Multipliers Assumptions, €M

			Multipliers		
Activity	**Direct Impact**		**Production**	**VAB**	**Employment per million VAB**
	Year 1	**Year 2-12**			
Investment	98.91	2.49	1.698	0.659	42.993
Wages		4.55	1.000	1.000	71.077
Land movement		22.84	1.808	0.731	51.555
Fuels and reagents		13.70	1.186	0.123	3.382
Transport		6.65	1.723	0.720	31.776
Shipment for export		5.99	2.084	0.750	17.174
Total	**98.91**	**57.42**			

Note: Source of INE multipliers.

Source: Own calculations.

Table 3.4 - Annual Direct Impacts, Comparison Project and Municipality of Boticas, €M

	Boticas	**Project**	**Var. %**	**Notes**
Employment (TCO)	1,302	119	9%	Just the private sector. An additional 71 to 122 jobs associated with the subcontracted company are added
Wage gains	14.409*	4.545	32%	Just the private sector. Average salaries with values much higher than the county average
Tax revenues (Municipal taxes)	0.629*	0.834	133%	Estimated value
Royalties		1.200		Estimated royalties. One third to be transferred to the municipality of Boticas
Social security	4.971*	1.198	24%	Estimated value

Note: (*) Values for the municipality of Boticas taken from the Sales Index database.

Source: Own calculations.

The direct impacts associated with the investment are presented in Table 3.4. For comparison purposes, the direct impacts of the project in terms of employment, salary gains, tax revenues, royalties and social security contributions are presented, and the corresponding amounts for the municipality of Boticas (without the project). Table 3.5 shows the indirect impacts in terms of gross value of production, added value and employment, in the year of investment and in the years of operation.

Table 3.5 – Indirect Impacts | Breakdown - National Terms, €M and Annual Employment eq.

Rubric	Production		Gross Added Value		Job	
	Year 1	Year 2-12	Year 1	Year 2-12	Year 1	Year 2-12
Investment	167.948	4.224	65.135	1.638	2,800	70
Wages		4.545		4.545		323
Land movement		41.289		16.698		861
Fuels and reagents		16.248		1.685		6
Transport		11.463		4.790		152
Shipment for export		12.487		4.494		77
Total	167,948	90,256	65,135	33,851	2,800	1,489

Source: Own calculations.

Table 3.6 - Indirect Impacts | Abstract - National Terms, €M and Annual Employment eq.

Macroeconomic Aggregates	Investment phase	Phase operation (annual average)
Gross Output	167.948	90.256
Gross Added Value	65.135	33.851
Job	2,800	1,489

Source: Own calculations.

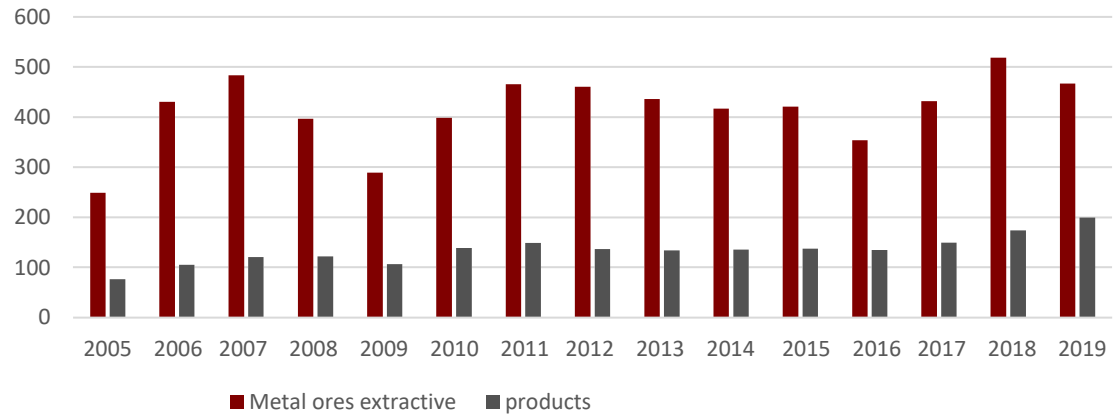
Table 3.6 summarizes the estimated impacts for the country as a whole. The domestic gross output is expected to increase by EUR 168 million in the investment phase, and by around EUR 90 million per year in the operation phase. The contribution to GDP formation is EUR 65 million in the investment phase and almost EUR 34 million per year in the operational phase. The impact on employment is 2,800 jobs (equivalent annual) in the investment phase, and almost 1,500 in the operation phase. In this estimation it was assumed that the gross surplus of exploitation generated by the project is not reinvested in Portugal. It is assumed, therefore, that the income associated with the capital is transferred in its entirety to non-residents, that is, the possibility of reinvestment in Portugal is excluded.

With this hypothesis the results of the exercise should be considered relatively conservative.

Other studies on the impacts of extractive projects at the local level report employment multipliers of between 1 and 2, for each additional job generated by the project. In the case under study, Savannah expects to hire an average of 119 individuals per year, which will be supplemented by between 71 and 122 employees to be hired by an entity that will be subcontracted to carry out the mining activity on the project. Thus, for each direct employment created on the holding (215 on an annual average) 5.9 indirect jobs (1,274 on an annual average) are expected to be created either through multiplier effects in other sectors or through the demand for goods and services necessary to ensure the operation of the mine.

The project also foresees that 86% of production is destined for export, which corresponds to an average annual value of 110.17 million euros. This volume of exports represents 20.1% of the average annual value of Portuguese exports of metal ores and other products from the extractive industries in the last fifteen years (Figure 3.2). [48] In this way, the project is expected to give a strong boost to domestic exports of this type of product.

Figure 3.2 - Exports of Metal Ores and Other Extractive Products, 2005-2019 | Portugal, €M



Source: Own calculations.

For the region and the municipality of Boticas to benefit from these impacts, a link between local suppliers and the company is required. Of the 100 larger companies in the municipalities of Boticas, Montalegre and Ribeira de Pena, half belong to sectors of activity related to the needs of the construction and operation of the project. These companies are mostly part of the construction, woodworks, electricity production, road transport, design and civil engineering services, commercialization of chemicals and construction articles, catering and hotel accommodation. These companies may be potential suppliers of services, equipment and consumable products of the extractive company.

[48] 16.5% of the 2019 figure.

Additionally, to increase the appropriation of locally generated income it is necessary to increase and qualify the supply of services and commercial activities, in order to meet the demand of workers hired in the operation. Of the 100 larger companies in the municipalities of Boticas, Montalegre, and Ribeira de Pena, about 70 will be able to provide goods and services to meet the needs of the workforce to be hired. The activities that will benefit the most from the increase in income associated with the saláripaid will be retail trade, catering services, transport services and personal services, as well as public services currently existing in the region.

Chapter IV. Territorial development and benefit sharing in Barroso

Chapter IV. Territorial development and benefit sharing in Barroso

4.1. Relevant territorial context

4.1.1. Territory

The municipality of Boticas is located in the North of Portugal, in the Alto Tâmega region, and belongs to the district of Vila Real. It is bordered to the north and west by the municipality of Montalegre, to the southwest by Cabeceiras de Basto, to the south by Ribeira da Pena and Vila Pouca de Aguiar and to the east by Chaves.

The Upper Tâmega region covers an area of approximately 2,922 km^2, where 86,466 inhabitants live[49]. The municipality of Montalegre is the largest area (805.5 km^2) in the region (Table 4.1). Ribeira da Pena is the municipality with the smallest territorial dimension (217.5 km^2). The municipality of Boticas has an approximate area of 322 km^2 and has a population of 5,059 inhabitants (2018).

Table 4.1 - Municipal Area | Upper Tâmega

Municipal	Area (Km^2)
Boticas	**321.9**
Chaves	591.2
Montalegre	805.5
Ribeira de Pena	217.5
Valpaços	548.7
Little Village of Aaron	437.1
Upper Tâmega	**2.921,9**

Source: INE.

The Sierra do Barroso occupies most of the municipality of Boticas. The municipal territory, which has a clearly mountainous landscape, has an irregular relief that limits accessibility, causing the isolation of some villages, and hinders large-scale agricultural production.

In addition to its diversity in terms of fauna and flora, the Alto Tâmega region also stands out for the geological richness of the various municipalities. This abundance is also notorious in terms of water resources, either because of the importance of rio Tâmega, which is one of the nine sub-hydrographic basins of the Douro and that crosses Boticas, Chaves and Vila Pouca de Aguiar, or by the importance of the Cávado sub-basin, which covers Boticas and Montalegre.

The location of Boticas is privileged from a cross-border point of view due to its proximity to Spain. The construction of the A7 and A24 motorways made it possible to improve connections with other municipalities in the region and the north of the country, but also with Spain.

In the municipality of Boticas there is a clear distinction between urban and rural space, with the village of Boticas as a polarizing urban nucleus and rural areas of scattered settlement with small aggregate populations. The Village of Boticas, integrated in the Union of

[49] INE, Annual estimates of the resident population. Data for 2018.

Parishes of Boticas and Granja, contains the more complex equipment and services, making it the relevant centre of territory's structure.

The residential property stock is characterized by the combination of main residences with secondary residences for periodic use by families residing elsewhere in the country or abroad. There is a clear reduction in the number of family-sized homes, as well as a portion of older housing stock, especially in rural parishes. The economic circumstances of some families are a constraint for the requalification of their homes.

The territory is especially rich in terms of biodiversity. The municipality of Boticas has a good state of preservation of its environmental heritage, which is reinforced by the presence of protected areas, such as the Natural Park of Alvão and the National Park of Peneda-Gerês.

Water for human consumption in Boticas is high quality. Parametric values have a compliance rate of 99.59%, above the national average. With regard to air quality, the municipality is part of an area with the classification of "Good"[50].

4.1.2. Demographics

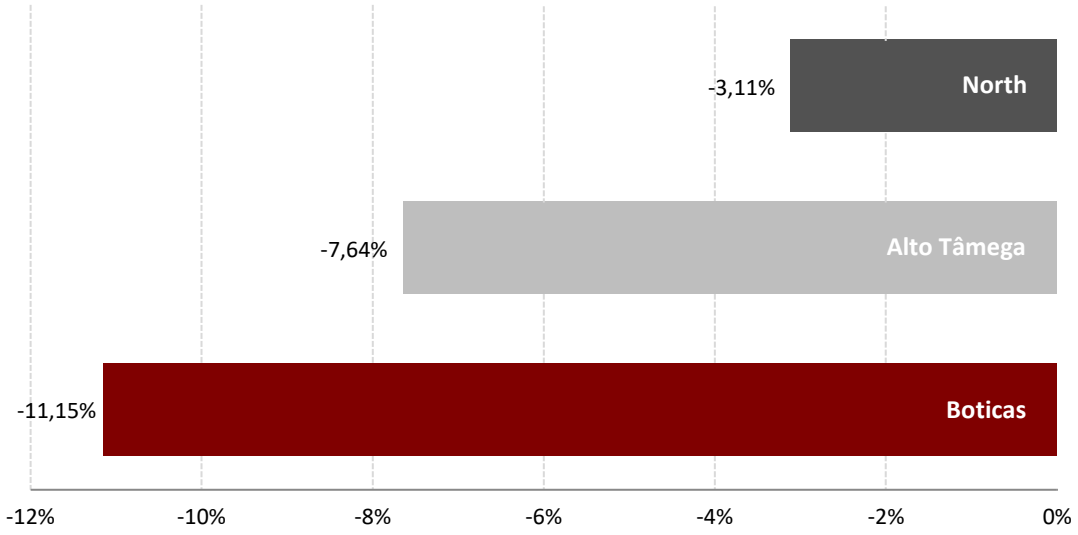
From a demographic point of view, the municipality is characterized by a sharp population loss, following the general trend of decline in the region where it is located. Between 2011 and 2018, the number of inhabitants of Upper Tâmega decreased by about 8% (Figure 4.1). This is the same trend, although more pronounced, than in the North region, whose number of residents decreases by approximately 3%. In the municipality of Boticas, the population drop in this period reached 11%, being, therefore, more intense than in Alto Tâmega and much more intense than in the North region.

Population decline and demographic ageing condition economic and social dynamics and have contributed to the economic and demographic recession of the most remote rural areas. With the exception of Boticas and Granja, where the municipal headquarters is located, the demographic regression extends to all the parishes of the municipality.

The Union of Parishes of Boticas and Granja concentrates about 26% of the resident population. Between 2001 and 2011, the population weight of the county's headquarters grew by 13.4%, largely due to intra-municipal population transfers (Table 4.2).

[50] Inner North Zone.

Figure 4.1 - Change in the Resident Population, 2011-2018



Source: INE, Annual estimates of the resident population.

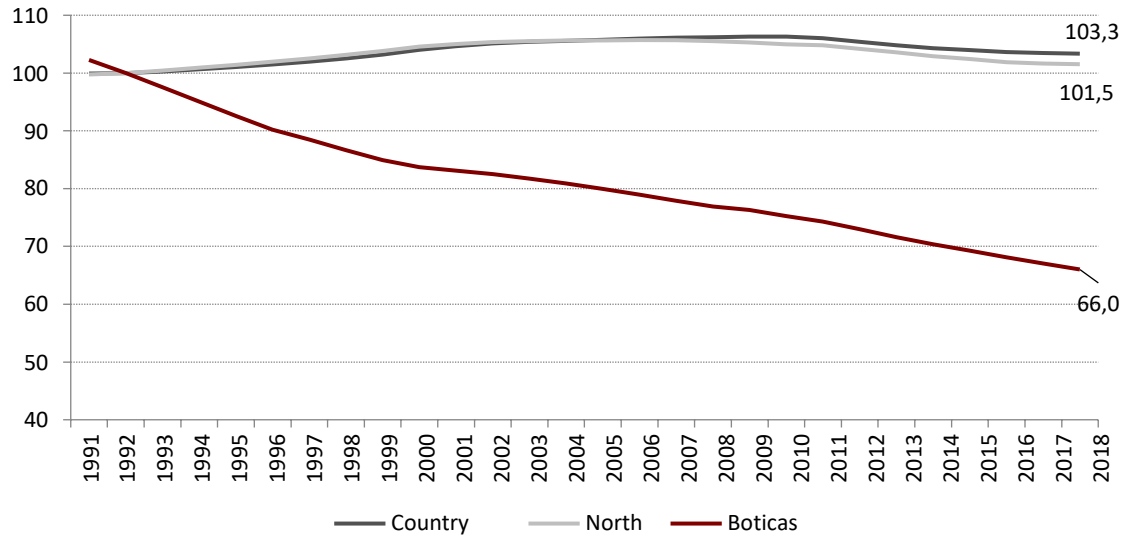
Table 4.2 - Resident Population, 2001 and 2011 | Boticas Parishes

Parish	2001	2011	Parish	2001	2011
Barroso Heights	444	399	**Curros, New**	87	67
Ardos	311	249	**Day**	413	338
Beça, New	1,031	843	**Fiães do Tâmega**	167	99
Bobadela, Georgia	354	330	**Farm**	266	230
Boticas	1,065	1,280	**Pine**	478	401
Cerdedo	176	145	**San Salvador de Viveiro**	345	293
Codessoso, New Year	168	132	**Sapions**	526	488
Covas do Barroso	348	262			
Boticas	**6,417**	**5,750**			

Source: INE, 2001 Census and 2011 Census.

The demographic decline is evidenced in Figure 4.2 and Figure 4.3. In the last 25 years (1993-2018), the resident population decreased by about 32%, from 7,477 inhabitants to 5,059 inhabitants. Based on a linear trend, it is estimated that the number of inhabitants of Boticas in the 2040s will decrease to around 3,000. This population scale may make it unfeasible to offer public services (education, health, safety and civil protection) as well as private services for the local market. The decline in the supply of services will result in lower volumes of employment.

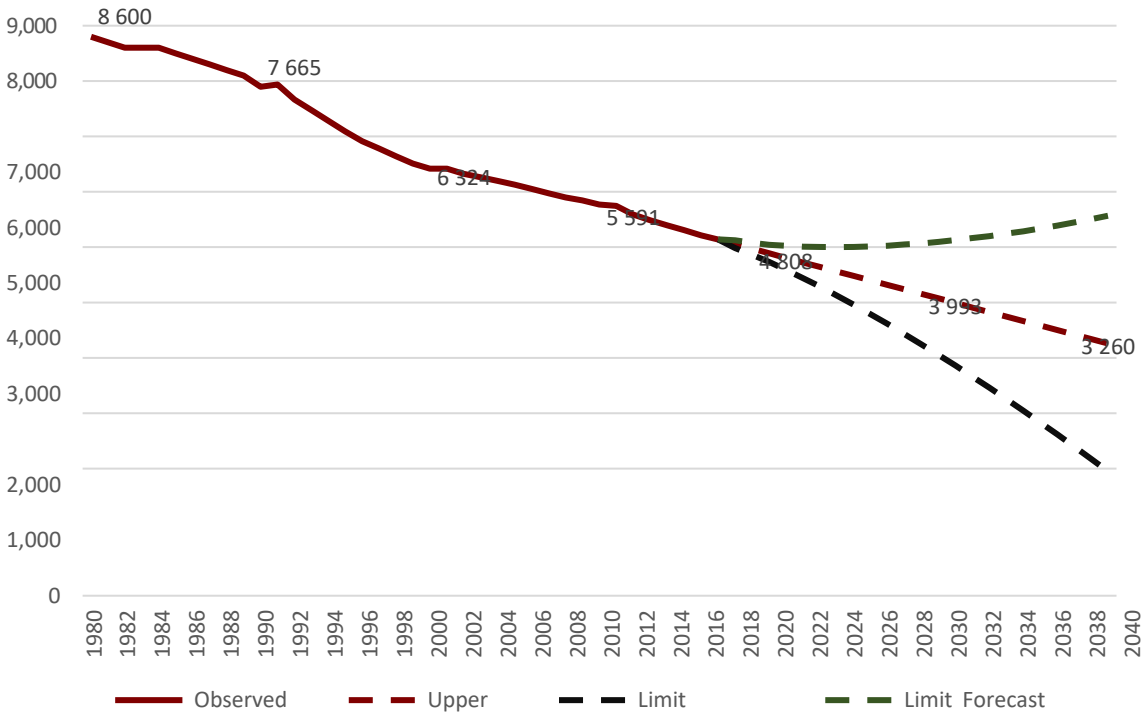
Figure 4.2 - Evolution of the Resident Population, 1991-2017 | Boticas



Rating: 1992=100

Source: INE, Annual estimates of the resident population.

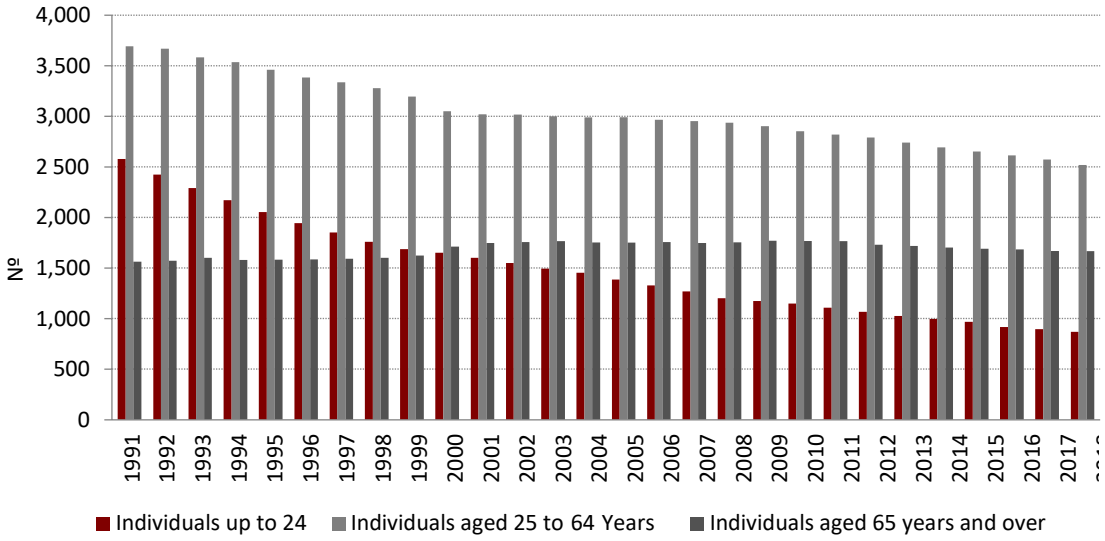
Figure 4.3 - Projection of the Resident Population, 1990-2040 | Boticas



Source: INE, Annual estimates of the resident population and own calculations.

The population loss of the municipality of Boticas is explained by a lower birth rate (4.9 per thousand inhabitants in 2018) to the mortality rate (19 per thousand inhabitants in 2018) and negative migratory flows derived from the rural exodus. Population outflow is explained by the search for more and better employment opportunities and access to public and private services.

Figure 4.4 - Age Structure, 1991-2018 | Boticas



Source: INE.

The analysis of the age structure reveals that the population's ability to renew and rejuvenate has decreased over time (Figure 4.4). In the last 25 years, the youngest population (up to 24 years) has decreased by more than 60%, from 2,292 individuals (in 1993) to 870 individuals (in 2018). In the same period, the population aged 65 years or older increased by 4%, from 1,602 individuals (in 1993) to 1,669 individuals (in 2018). Despite the increase in the population aged 65 years or more, the ageing of the population is mainly explained by the reduction in the effective number of young people.

Table 4.3 – Index of Ageing and Dependence on the Elderly, 2018

	Ageing	Dependence on the elderly
Boticas	366.8	56.9
Upper Tâmega	320.8	50.3
North	159.6	30.7
Country	162.2	34.5

Source: INE.

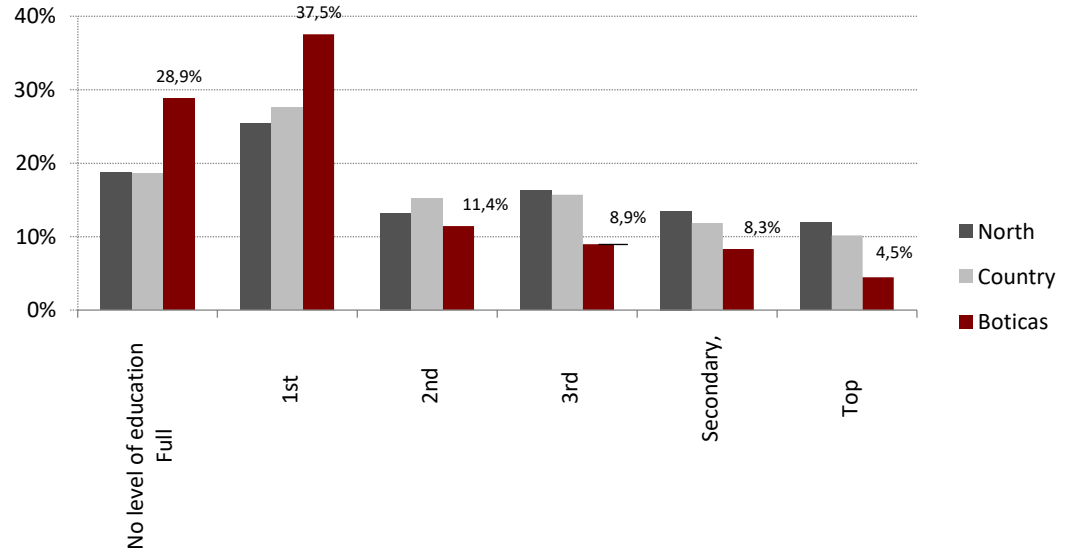
The demographic decline stimulated by population ageing is reflected in high rates of ageing and dependence of the elderly (Table 4.3), with implications for the productive capacity of municipalities and the search for social structures to assist the population. The ageing index for Boticas (366.8) is higher than the average of Alto Tâmega (320.8) and corresponds to about twice the average of the North region and the national average (around 160). Regarding the index of dependence of the elderly, the situation is quite similar, being in Boticas 56.9 compared to 50.3 in Alto Tâmega, 30.7 in the North and 34.5 in the country as a whole.

The ageing of the county is reflected in a higher proportion of pension beneficiaries in the total resident population aged 15 years or more. In 2017, the value of this indicator was clearly higher in Boticas (46.8%) than in the North region (34.4%) and the country (33.1%). In this context, there are also differences in the average value of pensions, presenting Boticas a lower value, 3,374 euros per year, versus the 4,915 euros annually and the 5,310 euros per year of the North and country, respectively.

Associated with population ageing, the municipality of Boticas has high levels of illiteracy, characteristic also of Alto Tâmega. However, at the subregion (NUT III) level, in recent years, there has been an improvement in the qualifications of residents, and Boticas is one of the municipalities that has experienced a positive evolution.

Between 2001 and 2011, a reduction in the illiteracy rate from 24.0% to 15.8% was registered in Boticas. Despite this positive evolution, the illiteracy rate is three times that of the North region, which in 2011 stood at 5%. It is also verified that the levels of training and qualification of the resident population are very low, with 9% of the population completing the 3rd Cycle of Basic Education, compared to 16% in the North and country, and only 8% secondary education, compared to 12% in the North and 13% in the country. Only 4% of the population completed higher education, compared to 10% in the North and 12% in the country as a whole (Figure 4.5).

Figure 4.5 - Resident Population by Higher Level of Education, 2011 (%)



Source: INE, 2011 Census.

In general terms, there is a reduction in the number of students enrolled in public education (Table 4.4). Regarding school dropout, the municipality of Boticas had, in 2011, a rate of 1.99%, which is higher than the average of the North region and country, with values of 1.53% and 1.65%, respectively.

Table 4.4 - Number of Students Enrolled in Public Education by Level of Education, 2010/11-2016/17 | Boticas

	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Boticas	**497**	**482**	**460**	**444**	**462**	**425**	**402**
Ed. preschool	69	66	70	69	62	47	49
Basic education	412	406	380	375	380	378	344
1st Cycle	188	179	166	147	132	139	140
2nd Cycle	99	90	95	101	108	93	70
3rd Cycle	125	137	119	127	140	146	134
Secondary education	16	10	10	-	20	-	9

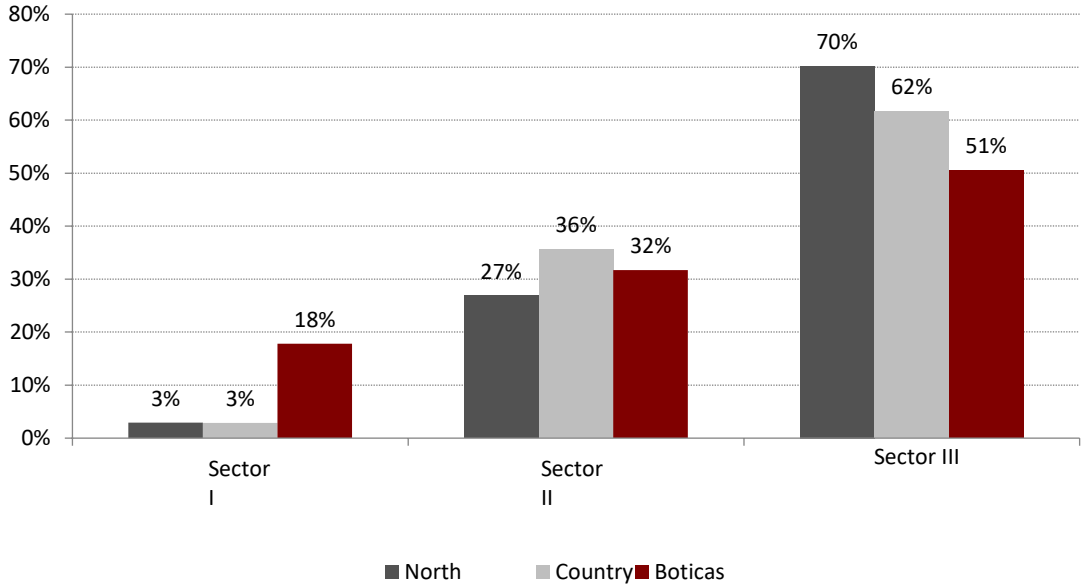
Source: DGEEC/MEC.

4.1.3. Economy and employment

In 2011, Boticas had an activity rate of 43.8%, lower than the 47.6% recorded in the North and country. With regard to unemployment, Boticas systematically recorded the lowest rates in Upper Tâmega and rates significantly lower than those in the North and mainland.

The municipality of Boticas has a productive structure strongly based on the primary sector, which occupies about 18% of the employed population, well above the values recorded for the North and the country (3%) (Figure 4.6). Between 2001 and 2011, the secondary and tertiary sectors were strengthened by the growth of manufacturing industries and construction-related activities, which concentrate the majority of the employed population. In the tertiary sector, we highlight the general trade and vehicle repair services, the Public Administration, education and health and social support services, which make up about 31% of the municipality's employed population.

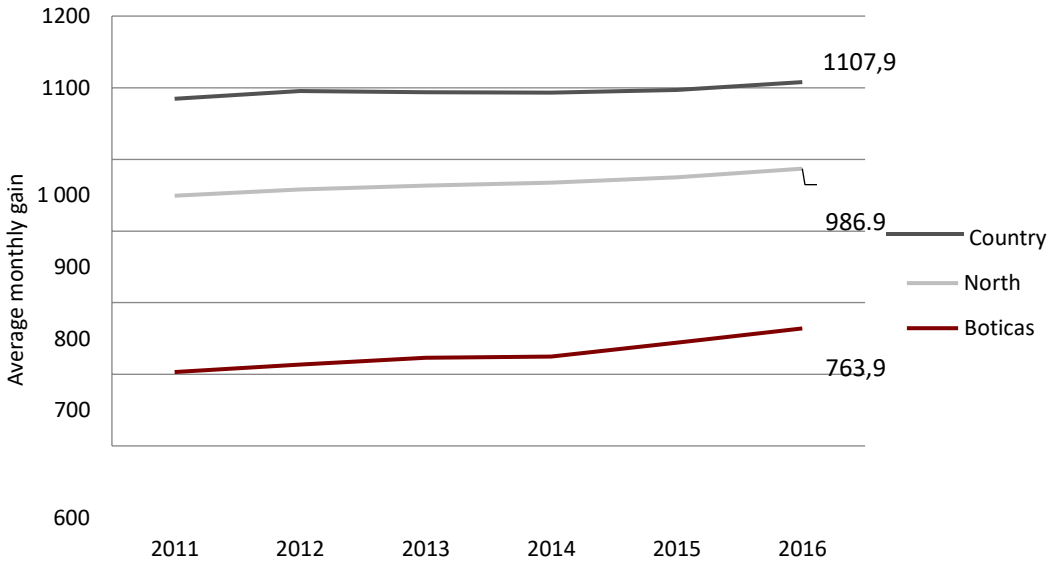
Figure 4.6 - Distribution of the Employed Population, 2011



Source: INE, Census 2011.

Regarding the *per capita* indicator of purchasing power (IPC), despite the improvements recorded in recent years, Boticas has a much lower value (59.9) than in the North region (92.0). With regard to the average monthly gain, the municipality of Boticas is below the average of the Upper Tâmega region (764 euros versus 844 euros in 2016) (Figure 4.7). Compared to the North and the country, this discrepancy is even more pronounced, increasing to EUR 223 and EUR 344, respectively.

Figure 4.7 - Average Monthly Gain (€)



Source: INE.

The importance of the primary sector is based on the natural conditions and traditions of the territory. The local productions framed in the sector present clear differentiating elements, however the sector as a whole has weaknesses in terms of productivity and competitiveness. Nevertheless, endogenous products have a very significant potential, being highlighted in this context the Barrosã meat, ham, lamb and Barroso honey, as well as potatoes and mushrooms.

As far as extractive industries are concerned, their role in the Upper Tâmega region is very relevant. In Boticas these industries are limited to activities of extraction of sand and gravel. Also, in the secondary sector is the energy subsector. The Boticas municipality has six wind-based electro-producing centres and a small hydroelectric power plant, with an installed power of 55.7 MWh.

Tourism activities are a factor in boosting the local economy and constitute a complementary income to the activities of the primary sector. Tourism allows families dedicated to agriculture and livestock to have an additional source of income, and at the same time generate complementarities by enhancing local gastronomy, using endogenous products.

The tourist indicators of Alto Tâmega and especially of the municipality of Boticas are clearly below those of the North and country, both in terms of supply and demand (Table 4.5). Despite the specificities of tourism in these territories, which may justify differences from the North and the Country, the definition of strategies that promote the increase in touristic activity are absolutely crucial from an economic point of view. To this end, initiatives to promote local gastronomy or other types of cultural, symbolic or sporting events are of great importance and should therefore be promoted and supported at local level.

Table 4.5 - Tourism Sector Indicators, 2017

	Municipality of Boticas	Upper Tâmega Region	Northern Region	Country
Hotel establishments (Nº)	4	63	1 313	4 456
Hotels (Nº)	2	18	326	1 154
Accommodation capacity (Nº camas)	120	2,308	62,855	352,133
Overnight stays (No.)	14,931	229,913	9,008,846	55,162,870
Average stay (Nº days)	1.6	1.8	1.8	2.5
Income (thousands €)	622	12,911	489,312	3,170,774

Source: INE.

For the valorization of endogenous and traditional products and the strengthening of tourism in the region, the municipality of Boticas benefited under the National Strategic Reference Framework ('QREN') with a total of 2 million euros. It is also worth mentioning, in the field of protection and valorization of the environment, the investment carried out in Boticas Park – Nature and Biodiversity, which amounted to 3 million euros.

The economic structure of the municipality of Boticas presents weaknesses that cannot be dissociated from the reduced demographic dynamism, the weak capacity to modernize agricultural activity and the existence of a business fabric in which small companies predominate.

Boticas' business fabric is mostly integrated by micro-enterprises (98%) (Table 4.6). The weight of the typology of entities has less expression, both in the North region and in the country as a whole (96%). In the county's micro-enterprises, given its eminently familiar structure, the number of staff in service is very small.

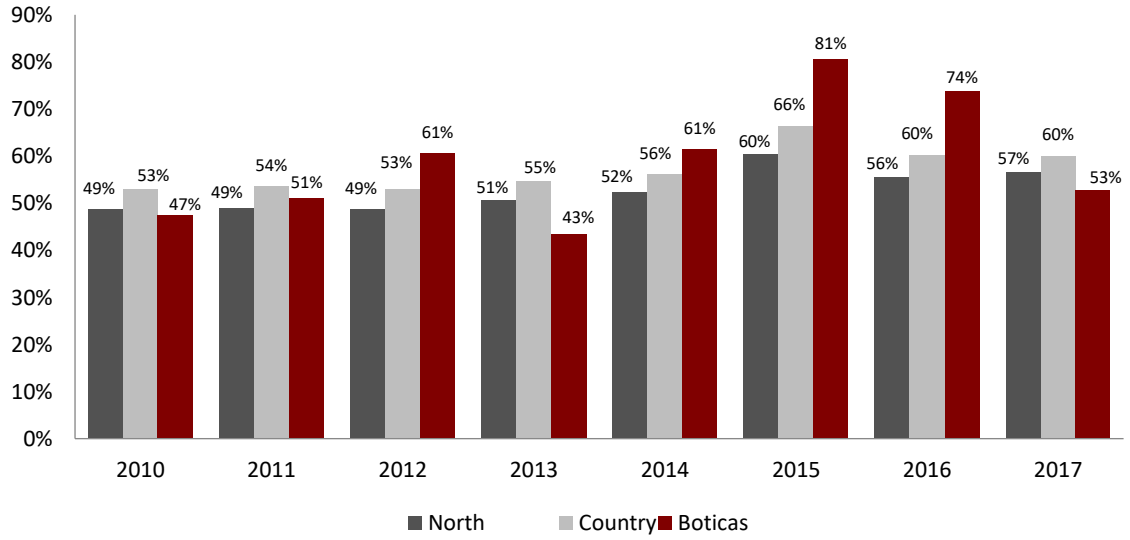
Table 4.6 - Companies Per Number of Workers

	Individual companies	Companies with less than 250 people in service	Companies with less than 10 people in service	Personnel at service by company (No.)
Country	67.87%	99.9%	96.3%	3.1
North	68.11%	99.9%	95.7%	3.1
Boticas	82.87%	100%	98.1%	1.7

Source: INE.

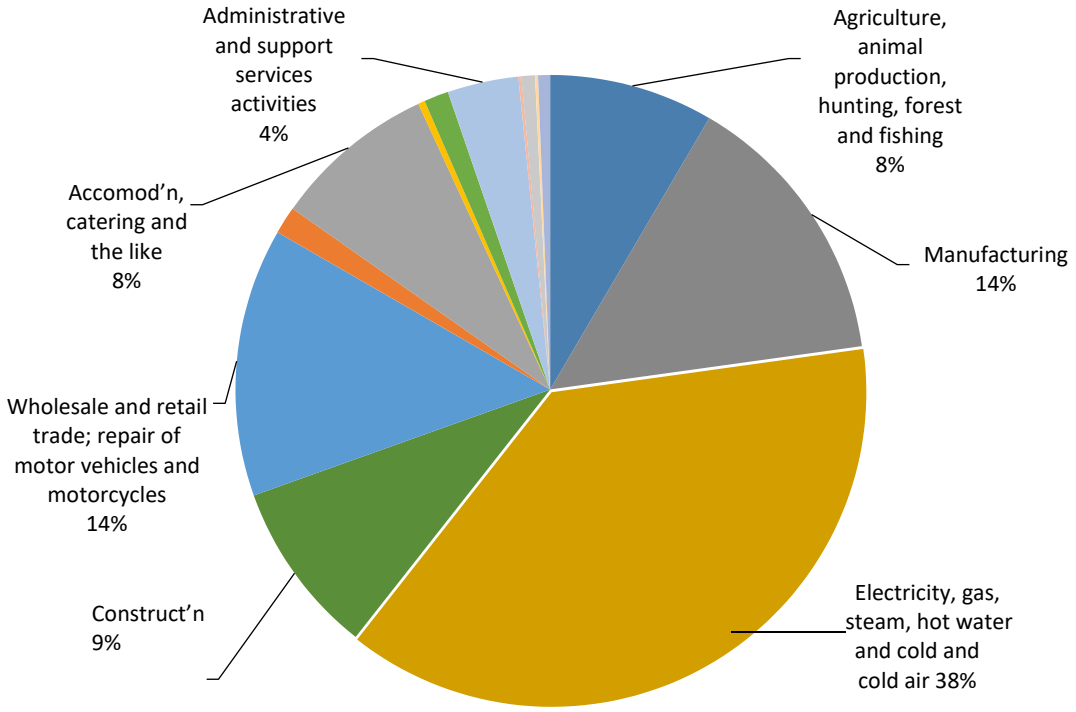
Between 2014 and 2016, in Boticas, the survival rate of companies under two years of age was higher than that recorded in the North and country (Figure 4.8). However, since 2015 there has been a trend reduction, which in 2017 resulted in a lower survival rate than the two references mentioned above (53% compared to 60% and 57%, respectively).

Figure 4.8 - Survival Rate of Companies After Trading for Two Years, 2010-2017



Source: INE

Figure 4.9 - VAB of Companies by Sector of Activity, 2016 | Boticas



Source: INE

In 2016, the turnover of companies in the municipality of Boticas was about 48 million euros. This amount corresponds to 5% of the turnover of the Upper Tâmega region and 0.05% of the North region. Regarding Gross Value Added (VAB), the municipality's contribution to Upper Tâmega and the North region was 5.3% and 0.06%, respectively. The activities that most contributed to the formation of the county's VAB were those related to electricity, gas, steam, hot and cold water and cold air (38%), manufacturing industries (14%) and wholesale and retail trade, as well as vehicle repair services (14%) (Figure 4.9).

In terms of international trade, Alto Tâmega follows the trend of export growth that is observed throughout the country. Between 2011 and 2018, NUT III exports from Alto Tâmega grew by 112%. This growth is much higher than in the North (42%) and in the country as a whole (34%). Conversely, in this period, the municipality of Boticas shows a decrease in the volume of exports (32%). More recently, between 2017 and 2018, exports originating in the municipality of Boticas decreased by 5.5% and imports increased by 4.8% (Table 4.7).

Table 4.7 - International Trade 2018, thousands of euros and %

	Boticas	Upper Tâmega	Northern Region	Country
Export of goods	1,258	70,986	22,684,670	55,214,821
Rate of change (2018/2017) (%)	***-5.5***	***32.5***	***2.4***	***5.5***
Import of goods	1,626	54 794	17 272,318	68,189,292
Rate of change (2018/2017) (%)	***4.8***	***18.7***	***4.2***	***7.6***
Balance of trade balance	-368	16,192	5,412,352	-12,974,471
Coverage rate (%)	77.4	129.6	131.3	81.0

Source: INE.

4.1.4. SWOT Analysis

The SWOT analysis allows systematizing and evaluating the position of the territory under analysis in relation to its internal and external contexts.

Strengths

- Unique environmental, natural and landscape heritage - partially inserted in protected areas;
- Primary sector with endogenous products of recognized quality - some with Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI);
- Proximity to Galicia and high potential for the materialization of cooperation initiatives;
- Good road accessibility in relative terms (A7 and A24 and on the Spanish side A-52);
- Existence of a pole of attraction in the municipality, the Village of Boticas, with sufficient size to ensure a reasonably diversified set of services;
- Sufficient offer of urban equipment and services in good condition;
- Availability of a responsive social support network, made up of a wide range of local partners, including IPSS.

Weaknesses

- Decrease and ageing of the resident population;
- Difficulty in fixing and attracting the young population;
- Low levels of training and qualification;
- Predominance of a small business fabric, with low technological intensity and low added value;
- Underutilized economic and productive potential;
- Distancing from the main regional and national decision-making centres;
- Reduced external visibility and recognition of the Upper Tâmega region and its territorial identity.

Opportunities

- High potential for materialization investment projects based on energy and environmental sustainability, in a context of great receptivity to sustainable products and services or that can contribute to raising sustainability levels and reducing carbon emissions;
- Significant potential to take advantage of the mineral resources of the municipality;
- Increased consumer responsiveness and therefore increased demand for local products with distinctive elements that call for authenticity, in particular certified local products;
- changing international trends in the tourism sector, with a strong growth in interest in rural tourism, of nature and, above all, of experience;
- Proximity to Spain, which can allow, on the one hand, to take advantage of market opportunities and, on the other, to implement collaborative strategies for the development of projects in various areas;
- Availability of funding under the different Operational Programs, with emphasis on areas related to innovation, sustainability and/or social inclusion, which can be used to reinforce the conciliation skills in various aspects.

Threats

- Significant reduction in the working population;
- Continuity of the exodus of the younger population to urban centres or abroad;
- Increasing proportion of the population in retirement;
- Risk of closure of public services in the county due to lack of scale, demographic decline and population ageing;
- Increasing dependence on public services and social and personal services in terms of job offer at local level;
- Potential increase in credit access difficulties for companies working in traditional sectors;
- Increasing competition between municipalities for investment, services, skills and initiatives of various nature.

4.2. The mineral resources in development strategies in Portugal

In several territorial planning documents, the main objectives, strategies and priorities of intervention for various spatial contexts in Portugal are identified. In almost all of them there are references to the use and valorization of mineral resources. In order to frame the project and justify its relevance from the point of view of the various territorial strategies, several national planning documents are reviewed, regional (NUT II) and especially sub-regional (NUT III), as well as documents of a different nature that are relevant in terms of contextualization and marking.

The most important instrument in the territorial management system in Portugal is the National Program for Spatial Planning Policy (PNPOT), which defines objectives and strategic options for territorial development and establishes the model of organization of the national territory (DGT, 2018a). It is also the framework for other territorial programmes and plans and provides guidance for the definition of strategies with territorial implications.

In 2019, the first PNPOT review was approved[51,52]. Based on the constant elements and trends contained in the strategic diagnosis of this review, five major territorial challenges are identified, subdivided into 15 territorially based strategic options. These strategic challenges and the corresponding strategic options are as follows (DGT, 2018b):

- Manage natural resources in a sustainable way - i) Valuing natural capital; (ii) promote the efficiency of regional and urban metabolism; and iii) Increase socio-ecological resilience;
- Promote a polycentric urban system – i) Affirm metropolises and major cities as engines of internationalization and external competitiveness; ii) Strengthen long-distance and rural-urban cooperation as a factor of internal cohesion; e, iii) Promoting urban quality;
- Promote inclusion and enhance territorial diversity – i) Increase population attractiveness, social inclusion, and strengthen access to services of general interest; (ii) boost local and regional potentials and rural development in the face of the dynamics of globalisation; and, iii) Promote cross-border involvement;
- Strengthen internal and external connectivity - (i) optimising environmental infrastructure and ecological connectivity; (ii) strengthen and integrate accessibility and mobility networks; and iii) Boost digital networks;
- Promoting territorial governance - (i) strengthening skills decentralisation and cross-sectoral and multi-level cooperation; (ii) promote territorially based collaborative networks; and iii) Increase territorial culture.

51 Law No. 99/2019, Diário da República No. 170/2019, Série I of September 5.

52 The figure of PNPOT was created by the Basic Law of the Policy of Spatial Planning and Urbanism of 1998. The first PNPOT was approved by Law No. 58/2007of September 4, amended by Statements of Rectification No. 80-A/2007of September 7, and No. 103-A/2007of November 23.

The PNPOT Review Action Plan includes a set of commitments for the territory, which reflect public policy bets for its enhancement, and which are operationalised within five Intervention Domains: i) Natural Domain; ii) Social Domain; iii) Economic Domain; iv) Domain of Connectivity; and, v) Territorial Governance Domain PNPOT (DGT, 2018c).

In the Natural Domain, optimization and adaptation are intended to boost the appropriation and capitalization of natural resources and the landscape. In this case, the measures contemplated are as follows:

- Manage water resources in a changing climate;
- Valuing soil resources and combating their waste;
- Affirm biodiversity as a territorial asset;
- Valuing the territory through the landscape;
- Plan and manage in an integrated way the geological and mineral resources;
- Order and revitalize forest territories;
- Prevent risks and adapt the territory to climate change;
- Valuing the coast and increasing its resilience;
- Qualify the urban environment and public space.

The measure plans and manages geological and mining resources in an integrated manner and results from the recognition that Portugal has significant geological resources, also in its maritime space, one of the largest in the world, involving mineral resources (metallic and non-metallic), mineral masses (quarries), hydrogeological resources (natural mineral waters and geothermal resources and geological and mining heritage, which is of interest in inventory, evaluation and value. It is also recognised that some of these resources have high global relevance, namely tin, tungsten, copper and lithium minerals.

In the diagnosis, strategy and action plan of PNPOT, several aspects with great relevance are also recognized in the scope of this study:

- That mineral resources are essential for the functioning of modern societies, in the information technology and telecommunications sectors and in the automotive, chemical and aerospace industries, and that this relevance will tend to increase in the future in the context of a low-carbon society;
- Whereas extractive industries are of fundamental importance not only for their contribution in terms of added value and exports, but above all for their impacts on territorial cohesion through job creation and consequent fixation of populations, since they operate mainly in inland territories, with low population density;
- That the direct and indirect impacts of this activity are duly enshrined in the Environmental Impact Assessment (EIA) procedures, in which it is sought that in the phases before, during and after the exploitation of resources there is an adequate balance between the economic, social, environmental and territorial aspects;

- That there is scope to ensure the compatibility of extractive activities with other activities and policies at local, regional and national level, based on the principles of sustainable development, covering in an integrated way the economic, social and environmental aspects.

The expected impacts: under the plan which measure and manage geological and mining resources in an integrated manner are (DGT, 2018c):

- Support the definition of an integrated strategy covering the entire suite of geological resources from a view to the circularity of the economy;
- promote sustained economic development, in particular in less-favoured regions;
- Define a framework for the compatibility of uses between mining and extractive activity and environmental and spatial planning values;
- Recover mining liabilities.

The Regional Plan for Territorial Planning of the Northern Region (PROT) is not in force. Although the proposed plan, drawn up at the end of the 2010s, has not been approved, the diagnoses, analyses and reflections have been used to support the definition of the priority axes and investment priorities of successive Regional Operational Programs.

PROT of the Northern Region includes three strategic orientations: i) Promoting the competitiveness and qualification of the territorial system; (ii) valuing resources and main regional economic-based activities; and, iii) Strengthen regional social and territorial cohesion with a view to reducing intra-regional asymmetries and defining minimum standards for the provision of fundamental public goods and services (CCDR-N, 2009).

The second of the guidelines is, among others, extremely related to one of the main ideas of PNPOT that aimed to encourage the exploitation of *environmentally sustainable wealth in geological terms, namely industrial rocks and metal ores.* The operationalisation of this strategic target of the PROT in this area was to *ensure the sustainable exploitation of natural resources and the sustainable management of water resources,* which is one of the measures proposed within the scope of this guidance.

This shows that the valorization of geological and mining natural resources has been systematically included in the spatial planning instruments. In the 2019 PNPOT review this issue seems to have gained momentum, as a result of the recognition of the relevance of these resources and the role of extractive industries in the economy and territorial development.

Geological and mineral resources and related industries have also had some relevance in government action over the past decade. During the intervention period of the Portuguese economy, in the early 2010s, the Council of Ministers adopted a Resolution[53], defining a

[53] Resolution of the Council of Ministers No. 78/2012, Diário da República No. 176/2012, Series I of September 11.

national strategy for geological resources. This initiative was aimed at boosting foreign investment in the exploitation of mining resources and promoting the sustained growth of the sector, increased exports and job creation. The ultimate objective of this Strategy was to make the extractive sector competitive and ensure the supply of raw materials, in a sustainability perspective, ensuring the balances between the economic, social, environmental and territorial aspects, given the direct and indirect impacts associated with the activity.

At the sub-regional level, the main planning instrument in place is the Upper Tâmega Integrated Territorial Development Strategy of late 2014, which was prepared following the establishment of the Intermunicipal Community of Alto Tâmega (CIM-AT, 2014). The strategy underpinning the document, with a time horizon of six years, is articulated in a set of Strategic Axes, to which several Strategic Objectives correspond:

EE1. Boosting the local economic base in a context of smart expertise

OE1. Valuing endogenous products and resources based on knowledge, research and innovation

OE2. Contribute to the organization of specific sectors in a logic of creating ranks and strengthening cluster relationships

OE3. Promote entrepreneurship with a view to maximizing the use of local resources

EE2. Promoting the efficient and sustainable use of resources

OE4. Protect, promote and monetize natural and cultural heritage as a distinctive element

OE5. Invest in the energy value chain as a competitive advantage of the territory. OE6.

Strengthen the protection and efficient use of water throughout its value chain

EE3. Promoting social cohesion and inclusion by valuing and strengthening the resilience of the local population

OE7. Support the qualification of human resources by promoting the adjustment of training offers to territorial and demographic characteristics

OE8. Strengthen social services in proximity to local communities, facilitate their access and operation in networks

OE9. Promoting innovative approaches to job creation, including skilled employment

EE4. Strengthening integration, regional identity and citizenship

OE10. Stimulate the articulation of competences and the shared management of public services

OE11. Promoting the capacity and efficiency of public administration

OE12. Foster strategic and competitive territorial cooperation

EE5.Consolidating territorial cohesion and the urban system

OE13. To destroy the urban system, contributing to the consolidation of a regional structuring pole

OE14. Promote the environmental, urban and landscape quality of the territory.

OE15Improving regional mobility and ensuring accessibility and connectivity

Of the various strategic axes, what is related to the valorization of geological and mineral natural resources is *the EE2. Encouraging the efficient and sustainable use of resources,* however none of the strategic objectives refer to their valuation. The references in the document to these resources and extractive industries, despite their importance in the region, are limited to the diagnosis and two operationalization measures: Constitution of a Technological Centre focused on the *extractive and transforming industry* of granites and *Landscape Requalification of old mines and quarries.*.

More recently the Intermunicipal Community of Alto Tâmega published a document entitled *Key Elements for Development 2030 – Alto Tâmega* (CIM-AT-2018). The document is based on another government document entitled *Future of Cohesion Policy - Portugal 2030 - Elements for Reflection.* It is referred to as one of the objectives *to strengthen the convergence of low-density territories by enhancing the* sustainable exploitation of *endogenous resources and diversifying their economic base*.

In the case of Alto Tâmega, the underlying strategy in the document is geared towards achieving Retention and Attracting Population, however they are also important purposes in this time horizon. To enhance the cohesion of the urban system, deepen cross-border cooperation, optimize the public service network and add value to region's assets. In the latter area, five areas of intervention are identified: i) Innovation and knowledge; (ii) agriculture, agro-industry, forestry and livestock; iii) Tourism; (iv) water, health and well-being; and v) Extractive industries. The explanation of the latter, keeping them autonomous, is a recognition of their importance and seems to indicate that in terms of public policy they should be the subject of a differentiated intervention.

In the same document are identified the seven strategic areas of intervention[54], of transversal character for the Upper Tâmega, by 2030. Specifically, they are as follows:

- Training;
- Intermunicipal Mobility;
- Territorial marketing and creation of cross-cutting products;
- Social economy and strengthening of the urban-rural service network;
- Agro-food /forestry cluster
- *Cluster* tourism - water, health and wellness
- Extractive cluster and the challenge of lithium

[54] The document contains strategic options.

In this strategic guidance document, policy makers assume that, in the coming years, the development of the extractive *cluster* and, in particular, of projects related to lithium extraction, is an aspect of great importance for the Upper Tâmega region. The document underlines the need to find mechanisms for benefit sharing and ownership of socio-economic and innovation impacts.

4.3. Territorial strategy - A proposal for Boticas

4.3.1. Framing and process

In productive areas, the High Tâmega strategy aims to boost the primary sector and the transformation of endogenous production, the tourism and welfare sector and, taking into account priorities by 2030, the extractive sector and the processing of rocks and ores. Across the board, it is intended to promote innovation and knowledge. Although Boticas can generally share this development strategy, it may place more or less emphasis on certain dimensions of it.

In territorial contexts with marked elements of differentiation, territorial identity can be the central component of development strategies. A territory that ceases to be anonymous and manages to project a positive image, thanks to the use of its endogenous resources, must capitalize on this favorable perception to feed back into the process of economic development. At the same time, they can incorporate other related dimensions, which reinforce the strategy, namely if resources are released to finance the dimensions considered central.

Given its size and capacity to generate impacts at local level, the Mina do Barroso project should be incorporated into the territorial development strategy, especially at local level. In the case of Boticas there is no explicit strategy that facilitates the identification of intervention priorities and the forms of compatibility of them with the extractive project concerned.

The lack of explanation of the development strategy at the municipal level does not mean that there is no strategy. To highlight the possibilities of reconciling the project with the implicit strategy currently in progress, an explicit exercise was performed, based on the diagnosis made and the observation/auscultation performed locally. The process of systematization of the strategy was guided by an architecture with well-defined components, which allowed organizing the current ideas and ongoing initiatives and connecting them with others in perspective and with the corresponding orientations and interventions. Based on the shared vision for the territory and its mission, a limited set of thematic and strategic objectives was defined, which are operationalised on a range of priority axes. These priority axes are configured from a set of local resources and initiatives, which contribute to the territorial competitiveness of the municipality, in grand measure, thanks to its distinctive character. Conceptually, the strategic architecture enunciated is presented schematically in Figure 4.10.

The different components of the strategy outlined result in:

- From the territorial diagnosis - summarizes the distinctive aspects of the county;
- Alignment with European, national and regional strategic guidelines – organises objectives and axes of intervention;
- Observation/interaction with local agents – well positioned to interpret local reality and anticipate future dynamics in various areas of interest;
- The analysis of various regional planning documents, of a conjunctural and strategic nature, of supramunicipal scope.

Figure 4.10 - Strategic Architecture

Note: The definition of the Operational Goals and Actions is outside the scope of the study.
Source: Own Elaboration.

4.3.2. Elements of the strategy

In Boticas, endogenous capital and territorial identity are central elements of the implicitly assumed development strategy. Territorial capital and identity are somehow incorporated into local productions and are, to some extent, broadcast in events that are periodically organized in the municipality. The reinforcement of the Boticas, Barroso, Barrosã and Fumeiro brands, derived from the intrinsic quality of the productions and the initiatives to enhance local resources, products and heritage, has been capitalized in terms of territorial attractiveness, with evident manifestations in the field of tourism.

The extractive project that is at the origin of the study is compatible with this strategy. Extractive activities are not complementary to those of sectors traditionally associated with endogenous development, however, depending on their characteristics, size and the environmental remedies introduced, their operation can be reconciled with those. As it is a spatially concentrated exploration, restricted in terms of land occupation, relatively isolated and efficient from an environmental point of view, Mina do Barroso guarantees that it is compatible with an endogenous development strategy based on territorial products and assets..

The definition of vision is the basic element of every strategy. The vision for a given territory generically establishes what is intended for it in terms of development. The vision for the municipality of Boticas can be summed up in the following assertion: "*An attractive territory based on the intelligent, sustainable and inclusive preservation and exploitation of* its resources and its *endogenous production.* " This vision can be divided into three components: (i) sustainable exploitation of its resources, both renewable and non-renewable; ii) valuing its endogenous capital; and iii) structuring and marketing of territorially based products [Table 4.8]. The vision translates into the mission through three thematic axes, one for each component: i) Improving the use of commercially valuable resources, through their exploitation and eventual transformation locally; ii) Improving the competitiveness of assets and

local production, through the valorization of differentiated resources and products from the primary and related sectors; and, iii) Improve the attractiveness of the territory and its symbolic capital, by enhancing the possibilities of attracting visitors / tourists and investment, focused on the sectors of tourism and complementary activities..

Each thematic axis is achieved in a strategic objective and in several operational objectives [Table 4. 9]. In this case, the strategic objectives are: i) Harness territorial resources to leverage economic activity (through the exploitation of unique and/or own resources and benefit sharing); ii) Capitalise on endogenous potential to generate value (through the valorization of endogenous resources and the organization of the institutional system); and, ii) To stimulate the different dimensions of the territory to generate attraction (through the design of tourist products, the potentiation of the attractiveness of the municipality and the organization of the institutional system). To achieve these objectives, Boticas has natural resources (minerals, wind, water), endogenous products (food products, handicrafts) and assets (natural heritage, landscape, built) that must be used or enhanced to leverage their development. Some of these resources, products and assets have been valued and marketed with some success. Nevertheless others should be: i) revalued or repositioned (some niche endogenous products); (ii) processed into saleable products or experiences isolated separately or in a package (assets valued through tourist products); or, iii) exploited and marketed as long as they have market value (natural resources, including mineral resources).

Table 4.8: Thematic Vision and Axes

Vision Proposal	
"*An attractive territory based on the intelligent, sustainable and inclusive preservation and exploitation of its resources and endogenous production*"	
Vision Components	***Thematic Axes***
A territory that exploits its territorial resources in a sustainable way	**Improve factor utilization** Exploitation and possible local transformation of natural resources, whether renewable or non-renewable **Key sectors:** Extractive and manufacturing industries; Energy production
A territory that values its endogenous capital	**Improving competitiveness** Market-oriented valuation of endogenous resources and products **Key sectors:** Primary and related
A territory that structures territorially based products	**Improve attractiveness** Potentiation of the possibilities of attracting visitors/tourists and investment **Key sectors:** Tourism and related

Source: Own Elaboration.

Table 4.9: Thematic and Objective Axes (I)

Thematic Axes	**Lever**	**Goals**
Improve Factor Utilization	Exploitation and possible local transformation of natural resources	**Strategic objective**
		Harnessing territorial resources to leverage economic activity
		Operational objectives
		- Explore own resources (minerals, wind, water) - Valuing extractive activity and its results locally - Enable benefit tab systems
Improving Competitiveness	Valuing endogenous resources and products	**Strategic objective**
		Capitalize on territorial potential to generate value
		Operational objectives
		- Valuing endogenous resources - Organizing the institutional system

Source: Own Elaboration.

Table 4.10: Thematic and Objective Axes (II)		
Thematic Axes	**Lever**	**Goals**
Improve Attractiveness	Design of territorially based products	**Strategic objective**
		Take advantage of the differential dimensions of the territory to generate attraction (and value)
		Operational objectives
		- Designing tourist products - Enhance the attractiveness of the municipality - Organizing the institutional system

Source: Own Elaboration.

4.4. Benefit sharing mechanisms and programmes - A proposal for Boticas

The implementation of the socio-economic development strategy proposed in the previous section and the operationalization of the strategic options assumed in the context of the CIM, with municipal reflection, need financial resources. Public sources of funding, mainly from the municipal budget and the Operational Programmes of Cohesion Policy, can in this case be complemented with private resources from the company promoting the Mina do Barroso project. Savannah, under its Social Operating License and Corporate Social Responsibility, is available, like most companies that exploit resources in developed countries, to enable benefit sharing programs with an impact on the local community.

The main instrument for the operationalisation of these programmes will be a Community Development Fund, managed by a not-for-profit Foundation. The administration of the Foundation will have a majority of local government (City Council and Parish Councils directly affected by the project – Dornelas and Covas do Barroso) and the local community (local associations, wastelands, NGOs, etc.). The administration may be completed with representatives of the central government, the company and some independent administrator, namely some expert from the academy. Savannah intends to provide the Foundation with an annual budget of 500,000 euros.

Another way to activate benefit sharing programs is through the resources that the local administration will receive under the royalty distribution agreement. At this stage of the negotiation, the municipality is expected to receive approximately some of the royalties that the company must pay each year to the central government (between 0.75% and 1%, of the 3% of the royalties to be applied).

While it cannot be framed in the area of benefit sharing, the increase in tax revenue that the local government will benefit from, notably in the form of IRC and fees, but also in the form of IRS, may be intended to finance or co-finance measures of these programmes. These resources can also be used to finance projects or measures that complement those included in benefit sharing programmes, generating synergies and amplifying their impacts.

In view of international best practices on benefit sharing, a set of programmes/interventions, organised in various thematic vectors, is proposed[55]. This exhaustive portfolio is preliminary in nature and must then be fine-tuned (extended, restricted or adjusted) in the context of negotiations between the undertaking, the municipality and the local community. Implementation aspects are outside the scope of this study.

Vector I - Mitigation and improvement

- *Housing rehabilitation program* focuses on improving thermal and acoustic insulation (e.g. window replacement) in rural centres close to the project;
- *Programme to improve the living conditions of housing*, focusing on the introduction
- of heating and hot water supply systems, through

[55] Some of these interventions are aligned with the proposals included in the Integrated *Stakeholder Management Plan,* made by S317 Consulting, for Savannah (S317 Consulting, 2019), specially designed for the population of the parishes of Covas and Dornelas

renewable energy-based technologies (e.g. solar thermal panels and biomass boilers for heating) in rural nuclei close to the project;

Vector II - Sharing

- *Programme for the use of installed capacity, underutilized or discontinuous* use and sharing of services with the local community in the field of:
    - Health services - Medical support to the population;
    - Fire services - Assignment / sharing of material and professional training actions;
    - Transport services - Assignment /sharing public transport vehicles;
    - Training services - Assignment / sharing of resources vocational training actions.

Vector III - Transparency

- *Information and auscultation* forums, which include periodic meetings of information on the company's activity and the collection of opinions and suggestions for improving coexistence with the community;
- *Program of visits to the mine and pedagogical initiatives related to the activity of the* company, namely study visits, industrial tourism, *geology workshops,* mineralogy and gemology and seminars on the extended value chain, among others.

Vector IV - Social Responsibility

- *Rehabilitation and maintenance program of equipment and services,* aimed at co-financing interventions in day centres for the elderly, sports and leisure equipment, mobility support services and access to services outside the municipality, among others;
- *Support program for day centres to ensure universal service, supplying the underfunding resulting from the inability to pay for some families (includes home support);*
- *Support program for the most deprived families, essentially through deliveries in kind or through co-payment or subrogation in payments for essential service program to support the most deprived families,* , mainly through in-kind deliveries or co-taxation or surrogacy in payments for essential services;
- *Program for the promotion of leisure activities* for young people, especially during vacation time, and for the elderly in day care centres;
- *Birth incentive program* for residents, which include direct (monetary) and indirect support (subsidies for the maintenance of daycare centres/nurseries);
- *Scholarship program for displaced students* from the municipality in regular secondary education / vocational education and higher education;
- *Program to support cultural programming* in the municipality.

Vector V - Sustainability

- *Environmental heritage improvement* program, which includes tree planting projects, autochthonous species recovery projects, rehabilitation projects for spaces with unique or exceptional environmental value, among others;
- *Program to improve the built* heritage, including projects to recover the cultural heritage, projects for the requalification of population centres and public spaces, among others;
- *Program for promoting proximity purchases and valuing local* products, covering fresh food acquisition projects for local producers to provide the company's canteen, promotion initiatives and enhancement of local products, especially from the primary sector in schools, fairs, exhibitions and tasting events, among others.

Vector VI - Infrastructure capacity building

- *Program of improvement and capacity reinforcement of the road network* to support the impacts of logistics associated with the activity;
- *Program to improve and increase the supply of infrastructure and equipment* necessary for the development of the activity (water, electricity ...).

Vector VII - Business training

- *Club of local suppliers of goods and* services, which materializes the commitment to privilege the acquisition of local *inputs;* focused on business *mentoring* – diagnosis and definition of strategies for competitiveness, and on business training for competitiveness. This type of initiative is currently supported through projects in co-promotion, financed by the Operational Programmes of the Cohesion Policy, which aim to encourage the participation of Portuguese companies, especially SMEs, in international value chains, through cooperation with nuclear enterprises that ensure better conditions for access to markets, technologies and skills;
- *R&D+i Unit - Research, Development and Innovation*, focused on the extractive sector and sectors located upstream and downstream in the value chains. This unit would aim to identify projects and technologies of interest in this field, especially in institutions of the National Scientific and Technological System, and support their development through direct financing or through co-financing programs, ensuring the partial ownership of their results and their application in local companies integrated in the ecosystem of project;
- *Entrepreneurship* program, oriented to the promotion of entrepreneurial spirit, training for potential entrepreneurs, *coaching* for entrepreneurs and consulting for the launch of new business or the development of existing businesses with growth potential;
- *Tourism development program* in rural areas, aimed at supporting financial and non-financial tourism projects in the region. Non-financial support should focus on supporting the preparation of applications for financing programs and structuring the operation, as well as consultancy and training-action activities;

- *Agricultural and livestock development program of Barrosã cattle and other indigenous* breeds, mainly oriented to actions in the fields of certification, cooperation between producers, professionalization, marketing, consulting technical training and training in business and marketing processes.

Chapter V. Conclusions and Recommendations

Chapter V. Conclusions and Recommendations

5.1. Main conclusions

The Mina do Barroso project is of great importance to the Portuguese economy:

- For the impact it could have on added value (+ EUR 437 million) and Portuguese exports (+ EUR 1,212 million) throughout the working phase of the project. The project will allow an increase of 20% of Portuguese exports of metal ores and other products from the extractive industries;
- For the drag effect it may induce on supplier sectors of the extractive industry. The total direct and indirect impact on the gross output in related sectors is EUR 1,161 million;
- For the stimulus that it can give to activities situated downstream of the activity of mineral extraction, for processing purposes;
- Because it could boost research and development and innovation activities, both upstream and downstream, in the value chains associated with the ores under exploitation;
- Because it will be able to promote professional training programmes, human resources qualification and the acquisition of skills specific to the sector;
- the impetus it could give to the development of other phases of the battery value chain, in particular the conversion of the mineral into lithium carbonate and lithium hydroxide and even in the long term to the manufacture of batteries, and consequently to the generation of national added value;
- For its ability to generate public revenues, via taxes, especially on company profits and salaries (IRC: +16 million euros /year; IRS: +2.3 million euros /year), social security contributions (+1.2 million euros /year) royalties (+ 3.6 million euros/year) and miscellaneous fees;
- For its demonstrative effect on the extractive industry. The project could serve as an incentive to develop other initiatives in the field of extractive industries for the exploration of the same or other ores and be used as good practice in the context of the country.

The Mina do Barroso project is of great importance to the European economy:

- Because it could allow the partial completion of the battery value chain considered strategic by the European Commission;
- Because it will ensure, at least in part, the security of supply to the European battery manufacturing industry, reducing dependence on countries outside the Union and reducing geopolitical risks and those associated with possible changes in trade policies and significant exchange rate changes;
- Because it ensures high levels of sustainability, as it is subject to Community legislation in this area and the regulation of a State of the Union. Ensuring the supply of extracted minerals using sustainable mining practices is a

European Union priority in the raw material dependent sectors;

- Because it could encourage investments in extractive industries in Europe to take advantage of the high potential of untapped resources still existing in several Countries of the Union;
- Because having great interest from a European point of view, by contributing to completing one of the phases of the battery value chain, it can be used, if properly implemented, as good practice for the sector in other contexts, both inside and outside Europe.

The Mina do Barroso project is of great importance for local economy:

- Because it has a high potential for direct job creation (+215 jobs / year) and indirect and, consequently, of fixing and attracting the active population. It is estimated that the overall impact at national level on job creation is 2,800 jobs (of equivalent annual duration) in the investment phase and almost 1,500 in the operation phase, a significant share of which may correspond to locally contracted employment;
- Because the type of jobs to be created requires easy-to-learn skills that facilitate the integration of local workers (from the municipality of Boticas or the surrounding region). The company estimates an annual investment in continuing training per worker of around 5,000 euros during the operation of the mine. About 10% of the staff to be hired should have higher education;
- Because major dam construction projects in the region are about to be completed. The workforce freed by these works can be easily relocated in the Mina do Barroso project, virtually without integration effort;
- Because it can contribute to boost local companies with the capacity to become service providers of the extractive company. Of the 100 larger companies in the municipalities of Boticas, Montalegre and Ribeira de Pena, half belong to sectors of activity related to the needs of the construction and operation of the extractive project. These companies may be potential suppliers of services, equipment and consumable products of the extractive company.
- Because it will allow to generate income locally, which may be appropriate dwindled on this scale via salaries and services, local taxes and other types of transfers from the company.
- Because part of the income from salaries and profits of service providers will have multiplier effects on others if it goes locally. The degree of income appropriation locally will depend on the capacity of the local economic and commercial structure to complex and qualify their offer. Of the 100 larger companies in the municipalities of Boticas, Montalegre and Ribeira de Pena, about 70 will be able to provide goods and services to meet the needs of the workforce to be hired;

- It is also expected a positive impact on the construction and renovation of the housing building; this impact will be relevant for the construction industry, the trade in construction materials and the trade in household equipment;
- Because if the degree of ownership is relatively high and materializes in the increase in supply organically or through the opening of new companies, the volume of business in the county will tend to increase; this dynamic will produce increases in employment and tax collection and expand the surpluses of business and consumers, essentially through diversification of supply and increase in variety;
- Because the generation of employment and income locally, either in the project, in related activities or in activities driven by additional income, will allow to fix and attract population and, therefore, generate demand for public services, ensuring minimum risk of closure of public services due to a demand gap. This argument is also valid for certain types of private services, which need minimal scales to ensure their viability;
- Because the operation of the project will require strengthening infrastructure, especially road, and improving some equipment for the benefit of the project, but which will ultimately benefit local co-unity in terms of accessibility and internal mobility;
- Because locally collected tax revenues can fund public policies to support the local population and improve infrastructure and equipment in the county. These resources may also be used to activate measures to encourage the establishment of workers on site, especially those directly and indirectly linked to the project, and the return of the population originating in the municipality, namely young people, who, for different reasons, left for nearby cities, the coast or even the other countries;
- Because the increase in the young population associated with the development of the project and the possible implementation of public policies to attract workers and promote the return may contribute to the increase in the birth rate and, therefore, these two effects in a combined way may lead to a population rejuvenation that neutralizes the current demographic decline;
- Because it could feed a Community Development Fund, which in turn can finance measures to build capacity and increase skills with medium and long-term scope.

5.2. Main recommendations

Given its economic and social impacts at different scales, the project should be rapidly operationalised. To these impacts, they also consider strategic actions for Europe and Portugal. The environmental impacts are outside the scope of this study, however the preliminary results of the Environmental Impact Study indicate that the negative impacts of the project do not seem to be very significant and clearly local, and that the planned mitigation measures are adequate to mitigate or neutralize some of them.

The main recommendations for the different agents with some involvement in the project are as follows:

Portuguese Government

- In compliance with the legislation in force, speed up as much as possible the deadlines for authorisations and permits necessary to set the project in motion. If in fact the government considers that this project and the exploitation of pegmatites for the production of lithium concentrate is a priority for the country, it should improve the regulation of the sector and the authorisation procedures, since the exploitation of this resource should take place in a window of opportunity that will not remain indefinitely open. The emergence and technological maturation of batteries that are alternative to lithium-ion batteries, based on sodium, potassium or fluorine, or even organic material, and increased competitiveness of other technologies, such as hydrogen fuel batteries, can sum up the supremacy of lithium in the manufacture of batteries, especially for the purposes of mobility;
- Promote the diversification of the economy, encouraging the development of extractive industries in the country to better take advantage of the potential of available resources. The transformation of extractive industries in the last two decades makes this type of activities safer and more sustainable today.
- Seek and support investments that complement those of extractive industries in order to complete value chains, sectorially complex the economy and incorporate more value by adding national to the production of ores;
- boost investment in R&D and innovation in projects related to the extractive sector and upstream and downstream activities in related value chains;
- Foster dialogue between stakeholders involved, promoting the convergence of interests between companies and local administration and the *hinterland* community of exploration, in order to promote the implementation and development of the project;
- Introduce legislative changes or simply take measures to improve the distribution of the benefits of the project between the national and local spheres. In this regard, it is suggested to balance the distribution of royalties between the central administration and the local administration and to ensure that the registered office (and tax) of extractive companies is located in the municipalities where their operation is carried out;
- Facilitate the creation of local development support vehicles, such as Community Development Funds, funded by the extractive company and managed by a foundation. The foundation's management should include representatives of the local community, local administration and independent experts and, where appropriate, some representative of the state and the company, who will occupy a marginal position in it.

Community institutions (European Commission, European Parliament and European Investment Bank)

- Discuss with the Portuguese Government and with the local administration the strategic importance of the Barroso mine project to complete the battery value chain in Europe;
- Launch a communication campaign underlining the importance of the use of mineral resources for the European economy and industry;
- To adopt legislation in the European Parliament on the development and regulation of extractive industries in Europe in order to promote the sustainable use of resources, protect local communities, encourage benefit sharing and increase legal certainty for extractive companies;
- Monitor the development of projects associated with the exploitation of LCT pegmatites in Portugal, as well as other projects for the exploitation of resources in which Europe is deficient and that may put at risk the proper functioning of its value chains;
- To invest in projects within extractive industries, in particular those dedicated to the operation of LCT pegmatites, through financial instruments of the European Investment Bank and the European Fund for Strategic Investments, basing the availability of these mechanisms in the contribution of these projects for the transition to a low-carbon economy;
- Continue to support the development of a business and institutional ecosystem around the battery value chain and promote its extension to the majority of the Territory of the Union;
- Assist the development of activities in the battery value chain in Portugal, downstream of the ore exploration linked to the project. Achieving complementarities is essential to increase added value and multiply the impact of the project.

Local Government

- Grant the necessary licenses for the start-up of the project. If the local administration considers that the project has added value at local level, it has to provide information to the affected communities and explain to them the advantages and disadvantages of the project, as well as create a state of opinion that favors its development. It is a question of contributing to the project to acquire a Social License to Operate that facilitates coexistence between all parties involved;
- Support the company to hire local services and manpower. The identification of potential local or regional suppliers and the establishment of preliminary contacts, as well as the granting of support for local hiring of workers, are essential to generate multiplier effects on the local economy in the long term;
- Facilitate the location of suppliers of goods and services of the extractive company in the municipality and support the emergence and consolidation of local companies that may integrate their supply chains and service provision;

- Promote spaces for dialogue and consultation between the company and the local community to generate empathy and resolve divergences, in order to reduce the impact of potential externalities and eliminate latent conflicts between the parties;
- Design programs to support local entrepreneurship and the creation of new businesses, with public-private funding, to fill market gaps at local level and diversify the sectoral structure of the municipality;
- Together with the extractive company, try to attract investments from related industries to the municipality or region, to take advantage of synergies derived from the clustering of activities and generate added value and employment;
- Make good use of the additional public revenue associated with the project channeling it to:
  i) the development of public policies for the generation of well-being and income distribution, which improve the quality of life of the resident population; and, (ii) for the adoption of measures to reduce context costs and create a *business-friendly* environment;
- Ensure that the resources that the company will channel to support local development, within the framework of its Social License to Operate and its Corporate Social Responsibility, are partly dedicated to financing initiatives that promote structural change.

Company

- Deepen links with the community and local government to secure the Social License to Operate, responding to the concerns arising from the execution of the project and trying to meet the needs that are being identified;
- Speed up preparations to start construction of the mine and its entry into operation. Ensure the financing of all phases of the project, prepare investment in capital goods and organize the provision of services for construction and operation purposes;
- Define a strategy for hiring service providers, focusing on local companies (the municipality and the surrounding region) and designing support mechanisms that allow them to increase their capacity and qualify their services;
- Establish an action plan for the hiring of local workers (from the municipality and the surrounding region), accompanied by a training plan to ensure the acquisition of the necessary skills to ensure the correct operation of the mine;
- Provide resources to carry out improvement works, periodic, in infrastructure and equipment that will be intensively used during the operation phase and that, consequently, will experience high levels of wear;
- Comply scrupulously with implementing regulations in all areas and, if possible, in some of them exceed compliance levels and introduce innovative procedures and policies that can be disclosed as examples of good practice;
- Promote the establishment of mechanisms for monitoring the operation of the mine and, in general, of the company's activity, with the participation of

local stakeholders, and be available to make adjustments to practices, behaviors and forms of operation;

- Implement a transparency policy, in which relevant and timely information is already available to the community and to all *stakeholders* with an interest in the company's operation;
- Fix the company's registered office in the municipality to ensure that tax revenues revert, at least partially, in the municipality;
- Create incentives for workers to establish their residence in the county;
- In the long term, promote, together with the local administration, the attraction of investments from related industries to enhance complementarities and generate added value and employment;
- Provide an annual financial amount, under the concept of Social License to Operate and Corporate Social Responsibility, to constitute a Community Development Fund. The fund should be managed by a foundation in the administration of which the community and local government should be majority. To ensure that its performance is aligned with local and regional development priorities, the foundation's presidency may be exercised by the Presidency of the local authority;
- Although the fund may allow the operationalising of recurrent public policies, its main purpose should be to finance sectoral and cross-cutting policies that promote structural change of the territory. These initiatives, with a medium and long-term horizon, should focus on capacity-building, institutional densification and qualification, increasing human capital and skills portfolio, improving infrastructure and equipment allocations and establishing investment support instruments (guarantees and capital). The ultimate objective of these interventions is for the local economy to reduce its dependence on the project so that, once completed, it has a sufficiently robust and competitive economic structure to ensure that the cessation of extractive activity does not have significant impacts on the territory.

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