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Massive Open Online Course (MOOC)

LECTURE 8 - SOCIAL INVESTMENT: A PORTUGUESE CASE

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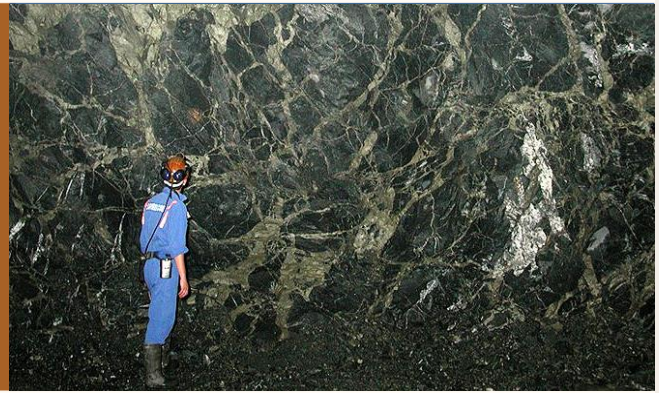

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Facts

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Type of mineral resources	**Copper, Zinc, Lead, Silver, Tin**
Open pit or underground mine	Underground
Stage of life cycle (exploration, planning/design, development/operation, closure/rehabilitation)	Operation
Period of activity	Continuously since 1988
Companies involved	Mineralisation at Neves-Corvo was discovered in 1977. Rio Tinto became involved in the project in 1985 in joint venture with the Portuguese government (EDM). On 2004, EuroZinc acquired a 100% interest in SOMINCOR (EDM/Rio Tinto) and merged with Lundin in 2006 retaining the Lundin Mining name. In 2025 Boliden acquired 100% of the shares of Somincor–Sociedade Mineira de Neves-Corvo, S.A
Environmental protected area designation: International (e.g. world heritage site, RAMSAR; EU (e.g. SAC, SPA); National (e.g. biodiversity areas, nature reserves)	REN (National Ecologic Reserve) and Natura 2000. REN is managed by CCDR and APA and the Natura 2000 by the ICNF, all State departments with different competences

CIRAN Location

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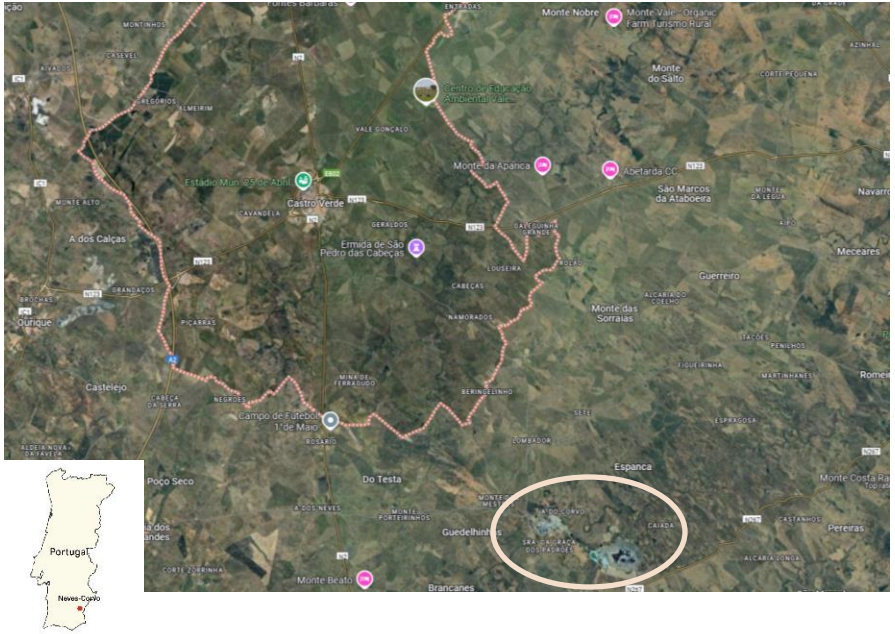
Location: Alentejo district of southern Portugal

Operation situated approximately 15 km southeast of the town of Castro Verde

Neves-Corvo has good connections to the national road network and a dedicated rail link into the Portuguese rail network and to the port

There are no major centres of population close to the mine, although there are many small villages with populations numbered in the hundreds. Most employees travel to the mine by provided buses or private cars.



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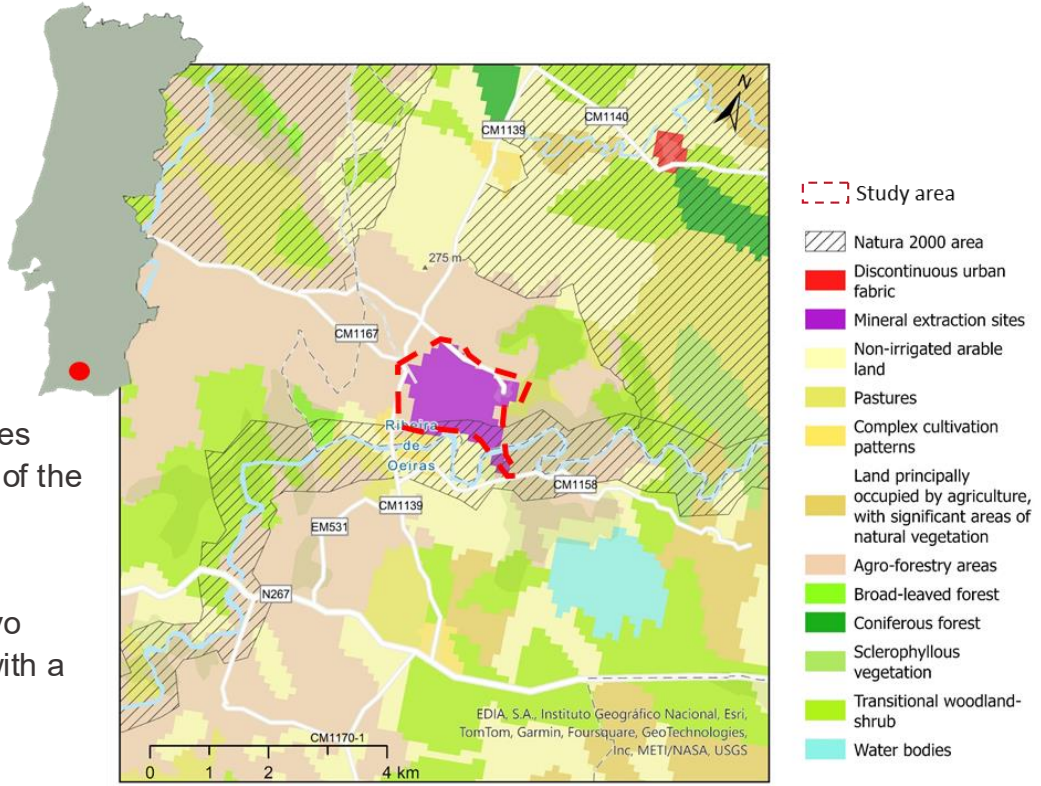
The Neves Corvo mine includes ground partially affected by the Birds Directive (SPA-Special Protection Areas, Castro Verde - PTZPE0046) and Habitats Directive (SCI-Sites of Community Importance, Guadiana-PTCON0036) and other specific soil use restrictions (REN-Reserva Ecológica Nacional and RAN-Reserva Agrícola Nacional) . The protected areas have been defined after the beginning

In parts of the mining operation there are activities that may affect habitats and biodiversity outside of the protected areas in less sensitive zones.

The environmental monitoring by the Neves Corvo mine goes well beyond the legal prerequisites with a tight follow-up extending to the totality of the concession area.



CIRAN Geology

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Exploration techniques

- soil geochemistry
- geological mapping
- airborne magnetics and gravity survey
- ground gravity and electromagnetic survey
- drilling
- 3D seismic survey development
- 3D regional geological model

It is one of the largest volcano-sedimentary massive sulphide deposits in the world (>300 Mt).

These deposits typically occur as lenses of polymetallic (copper, zinc, tin, lead) massive sulphides that formed at or near the seafloor in submarine volcanic environments. Seven massive sulphide lenses have been defined comprising Neves, Corvo, Graça, Zambujal, Lombador, Semblana and Monte Branco.

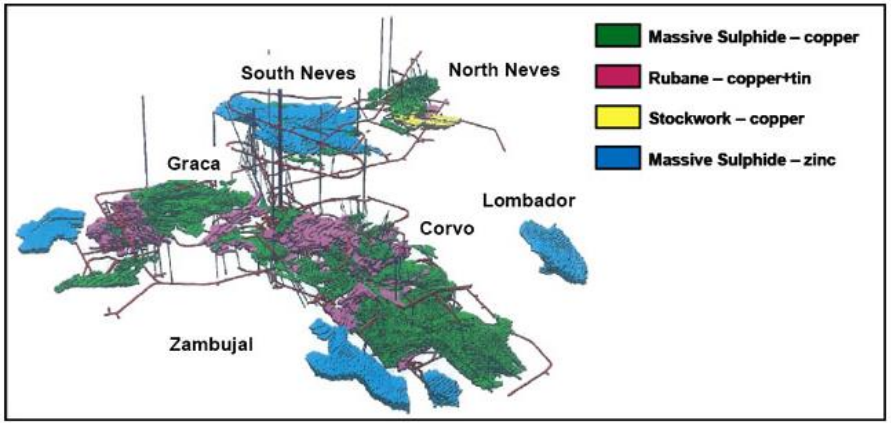

Figure 6 -3D view of Orebody Geometry and Mine Development (Somincor)

2008 Lundin Mining Corporation: Exhibit 99.1 - Prepared by TNT Filings Inc.
Neil Burns, MSc, Pgeo- Corporate Resource Geologist- Lundin Mining Corporation

CIRAN History

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Mineralisation at Neves-Corvo was discovered in 1977 by an exploration joint venture. Following the discovery, SOMINCOR was formed to exploit the deposits and first production commenced from the Upper Corvo and Graça orebodies on January 1, 1989, achieving 1.0Mt of throughput in that year.

Underground mining at the Neves-Corvo Mine has been continuous since 1989. The principal means of mine access are by a shaft and a ramp from surface. The shaft is used to hoist ore from the 700 m level while a conveyor descends from the 700 m level to transport ore from the deeper levels of the mine. The mine is highly mechanized and several different stoping methods are employed with the most significant being bench-and-fill and drift-and-fill.

The processing facility at Neves-Corvo comprises two plants. The copper plant processes copper ores and has a capacity of approximately 2.8 million tonnes per annum (Mtpa). The zinc plant, which can process zinc or copper ores, has recently undergone a significant expansion to a design nameplate capacity of 2.5 Mtpa.

Copper and zinc concentrates are transported by rail to a dedicated port facility at Setúbal from where they are shipped to variety of smelter customers that are primarily European based. Lead concentrate is containerized and trucked to ports for overseas shipment.

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Low-impact, low-visibility methods

For exploration:

Avoid trenching and other impacting excavations.

Field work (geophysics mainly) coordinated with the environmental agencies mainly to **avoid disturbance** principally during mating periods of wildlife

For extraction:

Low visibility because this is an **underground operation**, however it is worth mention that effort has been put into having also all **underground infrastructures** (offices, crushers, service vehicle shop)

Recent example of aspects implemented to protect nature has also been :

Soundproofing of the mine ventilation shafts

Visual impact Dust Noise Vibrations

Innovative techniques and measurements

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Low-impact, low-visibility methods

Processing

For **treatment**:
The **water treatment circuit was upgraded** with a RO (Reverse Osmosis) unit, enabling replacement of freshwater with treated water in the mine's paste plant.

Alternatives to the present main water supply (Santa Clara) reservoir continue to be studied both for potable water and operational water

Recent examples of aspects implemented to protect nature have also been :

Building of a storage facility for the copper concentrates in order to minimise **dust emissions**

Building of a new conveyer belt at the shipping dock at Setubal port to minimise **dust emissions**

Waste Management

For **ponds and tailings**:
In 2010, the tailings management facility was converted to a **thickened tailings deposition** facility with a thickened tailings plant (3 Deep Cone Thickeners) to increase the storage capacity and reduce the area of impoundment.

Recent example of aspects implemented to protect nature has also been :
Forced evaporation of the tailings

Water resource utilization Land use Dust

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Measurements adopted in closure

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- Continue **proactive management** of pipeline integrity from risk identification to mitigation;
- Continue to **monitor** and review **noise** levels from evaporators. Investigate further **noise abatement measures** and closely monitor any grievances related to noise levels;
- Timely update and submission to the authorities of required **operational management plans**;
- Environment policy introduction to all **employees**;

Protocols with environmental agencies:
Examples include: building of **biodiversity observatories**; replacing each holm oak tree (*quercus ilex*) cut by two new plants.

Further recent examples of aspects implemented to protect nature and cultural values have also been :

- Preservation of archaeological site
- Protocols with local farmers to keep agricultural fields operational

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Environmental management system

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Presently SOMINCOR implemented an environmental management system focused on the main environmental impacts and risks including human health, and biodiversity, among many other aspects. The system in place includes:

- Monitoring program
- Systematic control of the emission sources
- Process change on the elimination of the source impacts
- Control of the EIA requisites and the Environmental license
- Control based on internal and external audits
- Control of procedures and emergency plans

Control on the implementation of the closure plan

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Social and community aspects

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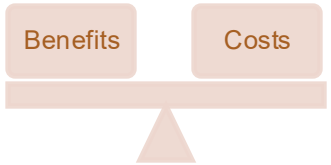
Engagement activity - Simple Stakeholder platform

Social Performance has been guided by SOMINCOR's Strategic Social Implementation Plan from 2019.

Informal stakeholder engagement strategies have been performed by the mining company during the relevant stage of the project.



Community investment was reported at US$295k in 2021 (excluding strategic social investment for entrepreneurship in schools).

84 % of the workers come from the region
Economically depressed area around the mine was transformed in one of the wealthier areas of the whole country.
Purchasing power of mining community more than doubled from 1993 to 2019.
(source: Somincor)

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Social and community aspects

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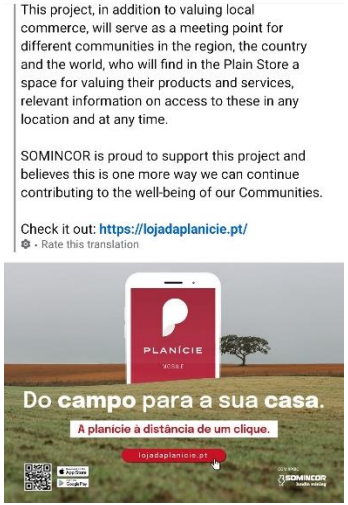
Identified areas of social investments



Areas of strategic social investment

- Community safety and emergency preparedness;
- Economic empowerment;
- Agriculture and animal husbandry;
- Education and training;
- Environmental stewardship and conservation;
- Culture and arts;
- Community wellness.

Somincor

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- Make some examples of solution to improve environmental performance in different life cycles stages of extractive activity
- Social and economical aspects – what is the relevance of the mining activity in the region and which are the actions of the company in this field

Further readings

Operations – SOMINCOR, S.A.
Boliden Somincor - Boliden

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Glossary

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Airborne Magnetics
A technique using aircraft to measure magnetic properties of rocks for exploration.

EIA (Environmental Impact Assessment)
A formal process to evaluate the environmental consequences of a proposed project.

Grievance Management Plan
A structured approach to handle complaints and concerns from stakeholders.

Massive Sulphide Deposit
A large concentration of metal-rich sulphide minerals, often containing copper, zinc, lead, and tin.

Polymetallic
Containing multiple types of metals, such as copper, zinc, and tin.

RAN (Reserva Agrícola Nacional)
Portugal's National Agricultural Reserve, protecting land for farming use.

REN (Reserva Ecológica Nacional)
Portugal's National Ecological Reserve, protecting sensitive environmental zones.

Reverse Osmosis (RO)
A water purification method used to treat and reuse water in mining operations.

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Glossary

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SCI (Site of Community Importance)
EU-designated areas under the Habitats Directive for conserving natural habitats and species.

Seismic Survey
A geophysical method using sound waves to map underground rock structures.

SPA (Special Protection Area)
EU-designated zones for the protection of bird species under the Birds Directive.

Stakeholder Engagement
The process of involving individuals or groups affected by or interested in a mining project.

Stockwork Zone
A network of small veins beneath massive sulphide deposits, often rich in copper.

Stoping Methods
Techniques used in underground mining to extract ore, such as bench-and-fill or drift-and-fill.

Tailings
Waste materials left after extracting valuable minerals from ore.

Thickened Tailings
Tailings that have been processed to remove excess water, reducing environmental impact and storage space.

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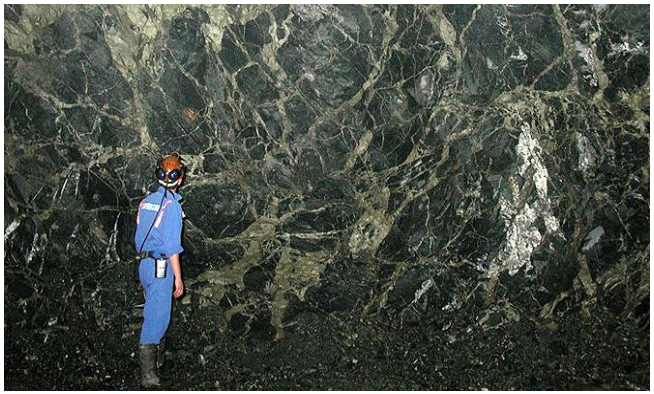
Thank you



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