

EUROPEAN INNOVATION PARTNERSHIP ON RAW MATERIALS



Coordinator: CARLOS FRÍAS, Technology and Innovation Director, COBRE LAS CRUCES, S.A.

Mining Companies: COBRE LAS CRUCES, S.A., SPAIN
EMED TARTESSUS, RIOTINTO, SPAIN
MINA DE AGUABLANCA, SPAIN
SOMINCOR, PORTUGAL
KGHM, POLAND
RTB BOR COMPANY, SERBIA

- TECHNOLOGY PILLAR IB. Priority Area:

Technologies for primary and secondary raw materials' production

- ACTION AREA:

I.2. Exploration

I.3. Innovative Extraction of Raw Materials

I.4. Processing and Refining of Raw Materials

❖ **SPECIFIC ACTIONS:**

- ACTION AREA I.2: Exploration.

New Exploration Technologies
Geo-models

- ACTION AREA I.3: Innovative Extraction of Raw Materials.

Automated Mining
Mining of Small Deposits

- ACTION AREA I.4: Processing and Refining of Raw Materials.

Innovative and Flexible Processing
Metallurgical Systems

NAME	COUNTRY
COBRE LAS CRUCES, S.A.	SPAIN
EMED TARTESSUS, S.A.	SPAIN
SOCIEDADE MINEIRA DE NEVES CORVO, S.A.	PORTUGAL
RIO NARCEA RECURSOS, S.A.	SPAIN
KGHM POLSKA MIEDZ S.A.	POLAND
RTB BOR GROUP	SERBIA
INGENIERIA DE SUELOS Y EXPLOTACION DE RECURSOS, S.A.	SPAIN
TECNICAS REUNIDAS, S.A.	SPAIN
MINING AND METALLURGY INSTITUTE BOR	SERBIA
MAXAM EUROPE S.A.	SPAIN
CYTEC INDUSTRIES B.V.	U.K.
OUTOTEC	FINLAND
BASF	GERMANY
LULEA UNIVERSITY OF TECHNOLOGY	SWEDEN
ALS GROUP	IRELAND
INSTITUTO GEOLÓGICO MINERO ESPAÑOL	SPAIN
AGQ MINING & BIOENERGY	SPAIN
MINTEK	SOUTH AFRICA
BUREAU DE RECHERCHES GÉOLOGIQUES ET MINIÈRES	FRANCE
AYESA	SPAIN
LABORATORIO NACIONAL DE ENERGIA E GEOLOGIA	PORTUGAL
MINPOL KG - AGENCY FOR INTERNATIONAL MINERALS POLICY	AUSTRIA
MONTANUNIVERSITAET LOEBEN	AUSTRIA
MINERAL INDUSTRY RESEARCH ORGANISATION	U.K.
IMPERIAL COLLEGE LONDON	U.K.
UNIVERSIDAD POLITÉCNICA DE MADRID	SPAIN
GA DRILLING	SLOVAKIA
INSTYTUT METALI NIEZELAZNYCH GLIWICE	POLAND
DATUM MONITORING	U.K.
TNO	NETHERLANDS
ATLAS COPCO	SWEDEN
SANDVIK MINING	SWEDEN
PAQUES B.V.	NETHERLANDS

- Coordinator: Cobre las Cruces
- Partners (33):

Spain (10): CLC, EMED Tartessus, Aguablanca, Inersa, Tec. Reun., Maxam, IGME, AGQ, Ayesa, Esc. Minas Madrid

Portugal (2): Somincor, LNEG

U.K. (4): Cytec, Miro, Imp. College, Datum Monitoring

Ireland (1): ALS

France (1): BRGM

Germany (1): BASF

Austria (2): Minpol, Univ. Leoben

Holland (2): TNO, Paques

Poland (2): KGHM, IMN

Slovaquia (1): GA Drilling

Serbia (2): RTB Bor, Mining Inst.

Finland (1): Outotec

Sweden (3): Atlas Copco, Sandvik, U. Lulea

South Africa (1): Mintek

Polymetallic Sulphides Deposits in Europe

SPAIN, PORTUGAL, SWEDEN, IRELAND, FINLAND, POLAND, GREECE, ETC

RIO TINTO

LAGOA SALGADA

GARPENBERG

AGUAS TEÑIDAS

ALJUSTREL

NAVAN

SOTIEL-MIGOLLAS

NEVES CORVO

TARA

AZNALCOLLAR-LOS FRAILES

TALVIVAARA

LISHEEN

COBRE LAS CRUCES

PYHASALMI

SILESIA-CRACOW

AGUABLANCA

BOLIDEN

LAVRIUM

PolymetOre Project

DEVELOPING INNOVATIVE SOLUTIONS FOR EFFICIENT AND SUSTAINABLE PROCESSING OF POLYMETALLIC AND COMPLEX ORES

Cu

Zn

Pb

PolymetOre

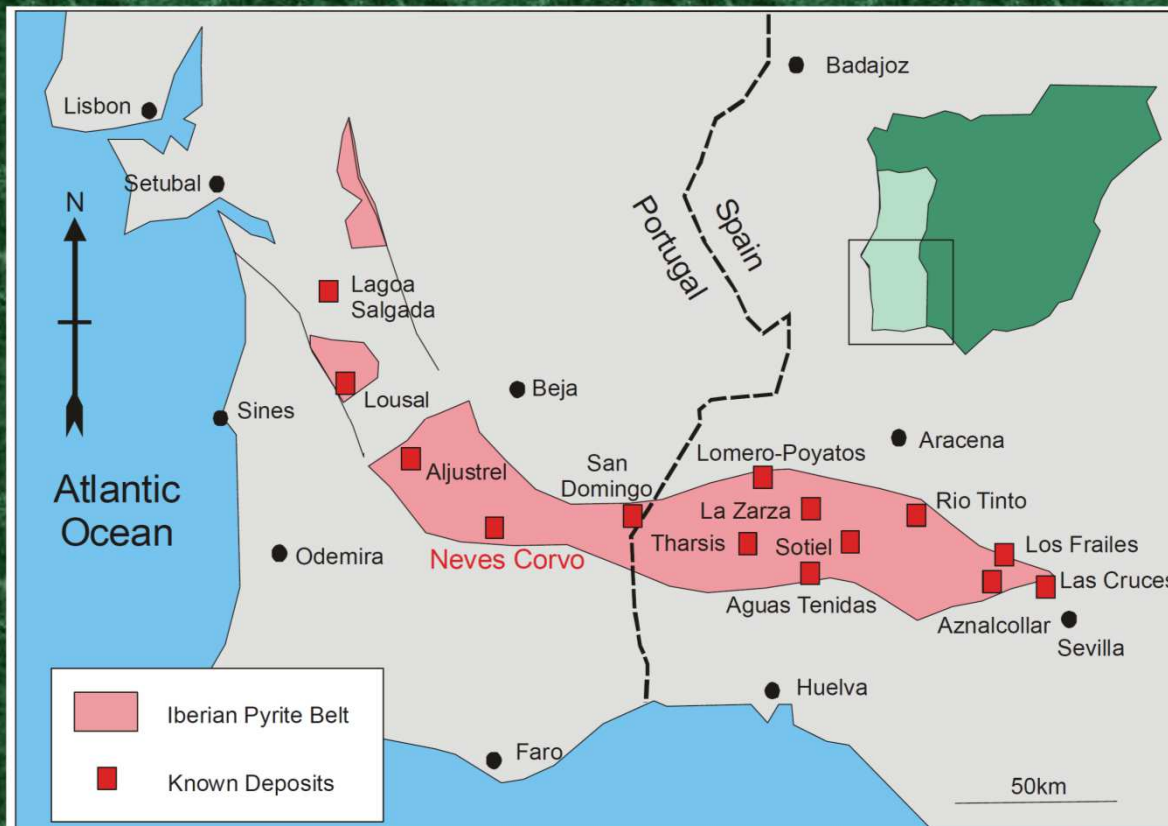
POLYMETALLIC • ORES • PROCESSING

Ni

Au

Ag

OBJECTIVE: Implementation of a PILOT ACTION on polymetallic ores at the Iberian Pyrite Belt



Main deposits and developed mines in the Iberian Pyrite Belt (WAI, 2007)

IBERIAN PYRITE BELT MINING REGION

- Covers a territory of 240 km by 35 km in Spain and Portugal
- Estimated current resources are over 1,500 million tonnes of massive sulphides
- Mined more than 5,000 years, having over 200 mines open along the times

- The industrial-scale mining exploitation started at the end of XIX century mainly focused on copper extraction and pyrite for sulphuric acid production
- The modern mining projects were developed along the 70's and 80's of the XX century and aimed to produce copper, zinc, and lead concentrates through selective flotation

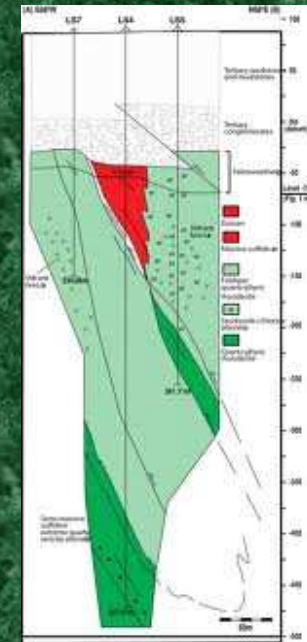
IBERIAN PYRITE BELT (IPB) Open Mines and New Mines

RUNNING MINES AT THE IPB

- ❖ PORTUGAL: ALMINA, SOMINCOR
- ❖ SPAIN: AGUABLANCA, AGUAS TEÑIDAS, COBRE LAS CRUCES

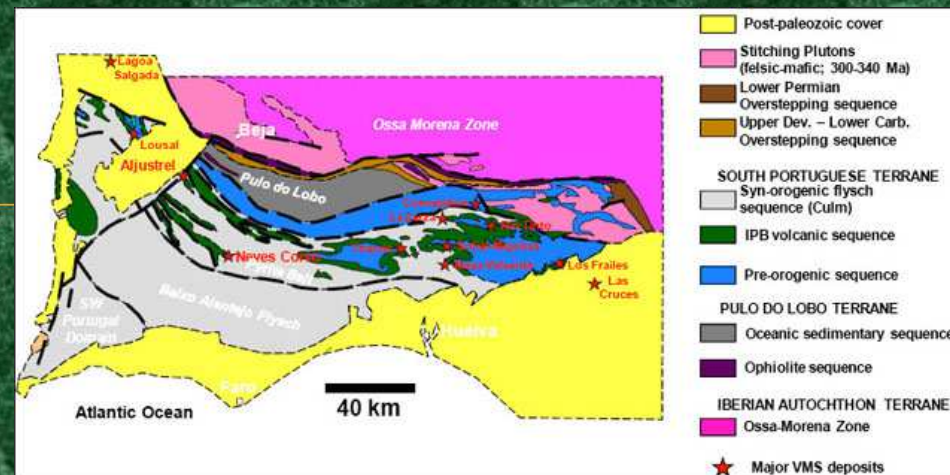
MINES IN RE-OPENING PROCESS AT THE IPB

- ❖ PORTUGAL: LAGOA SALGADA
- ❖ SPAIN: RIOTINTO, SOTIEL-MIGOLLAS, AZNALCOLLAR-LOS FRAILES
LOMERO POYATOS, LA ZARZA, THARSIS-FILON SUR



NEW MINING PROJECTS AT THE IPB

- ❖ PORTUGAL: SEMBLANA
- ❖ SPAIN: MASA VALVERDE
LA MAGADALENA



POLYMETALLIC ORES COMPLEX ORES, LOW-GRADE ORES

POLAND: THE KUPFERSCHIEFER

- ❖ In south-western Poland, a copper-bearing shale formation, the Kupferschiefer, occurs. The copper-bearing shale is the principal ore, having bituminous nature. KGHM Polska Miedź S.A. is the established mining company and owns several mines and refineries.

POLAND: SILESIA-CRACOWIAN Zn-Pb DEPOSITS

- ❖ The Upper Silesian ore district in south-central Poland is an important producer of Zn and Pb. For the last twenty years, the mine production was around 4-5 million t/y of ores. Main mining company operating in that district is ZGH Boleslaw owning mines and refineries as well.

SERBIA: BOR MINING DISTRICT

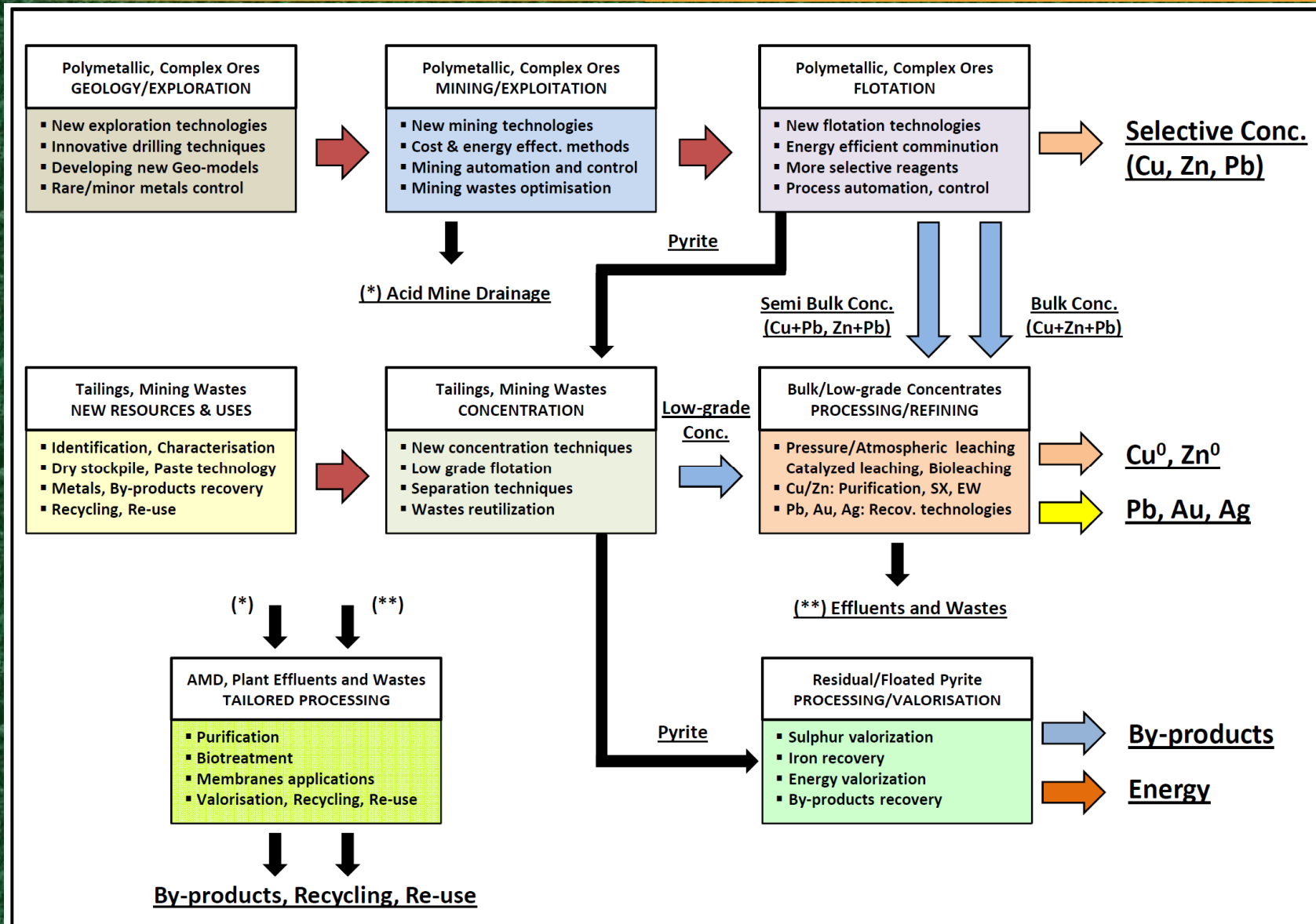
- ❖ Bor is a town located in eastern Serbia and owns one of the largest copper mine in Europe: RTB Bor, including mines and smelter. RTB Bor returned to profit in 2011. On the other hand, Serbian government took the decision to help fund the new smelter, which should be finished by 2014 and will nearly halve the cost of copper production.



PolymetOre Proposal

- **Leading by Mining Companies**
- **Focused on Innovations having Practical Applications**
- **Demonstrate the Viability of the Solutions in a Pilot Action**

PolymetOre Conceptual Scheme



Budget and Funding Plan

NAME	BUDGET
COBRE LAS CRUCES, S.A.	15.000.000
EMED TARTESSUS, S.A.	15.935.000
SOCIEDADE MINEIRA DE NEVES CORVO, S.A.	2.300.000
RIO NARCEA RECURSOS, S.A.	465.500
KGHM POLSKA MIEDZ S.A.	0
RTB BOR GROUP	1.620.000
INGENIERIA DE SUELOS Y EXPLOTACION DE RECURSOS, S.A.	5.450.000
TECNICAS REUNIDAS, S.A.	3.250.000
MINING AND METALLURGY INSTITUTE BOR	2.700.000
MAXAM EUROPE S.A.	2.300.000
CYTEC INDUSTRIES B.V.	2.237.000
OUTOTEC	2.200.000
BASF	2.100.000
LULEA UNIVERSITY OF TECHNOLOGY	2.000.000
ALS GROUP	2.000.000
INSTITUTO GEOLÓGICO MINERO ESPAÑOL	1.925.000
AGQ MINING & BIOENERGY	1.800.000
MINTEK	1.500.000
BUREAU DE RECHERCHES GÉOLOGIQUES ET MINIÈRES	1.000.000
AYESA	820.000
LABORATORIO NACIONAL DE ENERGIA E GEOLOGIA	735.000
MINPOL KG - AGENCY FOR INTERNATIONAL MINERALS POLICY	700.000
MONTANUNIVERSITAET LEOBEN	600.000
MINERAL INDUSTRY RESEARCH ORGANISATION	500.000
IMPERIAL COLLEGE LONDON	500.000
UNIVERSIDAD POLITÉCNICA DE MADRID	458.750
GA DRILLING	450.000
INSTYTUT METALI NIEZELAZNYCH GLIWICE	350.000
DATUM MONITORING	288.000
TNO	0
ATLAS COPCO	0
SANDVIK MINING	0
PAQUES B.V.	0
TOTAL	71.184.250

- Estimated Budget:
> 71 Millones Euros

- Funding Plan:

EIP-RM, H2020, Pilot Action:
= 70-75 %

National, Regional Programmes:
= 10-15 %

PolymetOre consortium:
= 15-20 %

- **PHASE 1: 2014-17**
Settling the project basis and undertaking preliminary developments.
- **PHASE 2: 2017-20**
Implementing a **PILOT ACTION in the Iberian Pyrite Belt.**
- **PHASE 3: 2020**
Final Feasibility Study for commercial application.

