

BioMinE

**“Integrated project for the development
of biotechnology for metal-bearing
materials in Europe”**

Co-financed by the EU in the frame of the RTD FP6

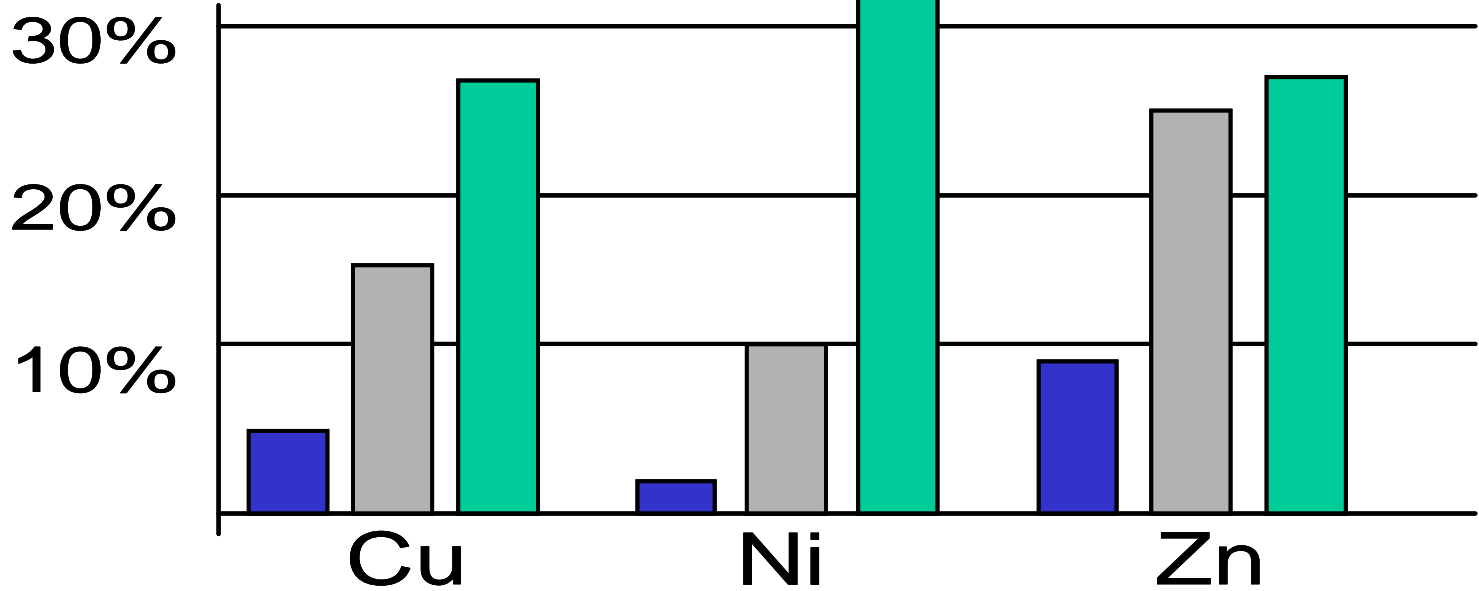
General Coordinator BRGM – Dominique MORIN

European Base Metal Status



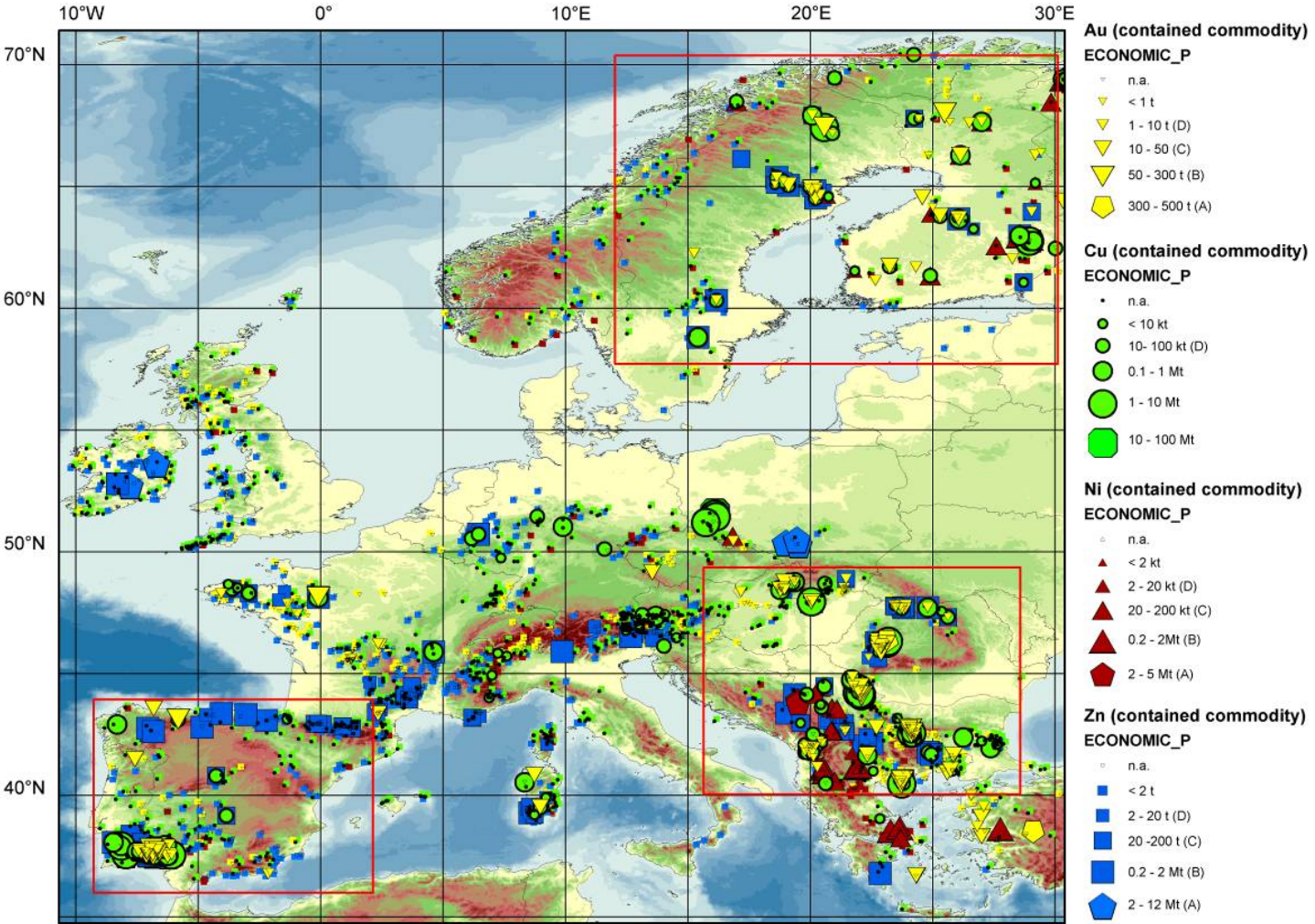
% of EU25 in global production / consumption

- Mine production
- Metallurgical production
- Consumption



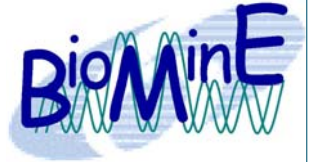
Europe's metal need is highly dependent on importation

European Resource Assessment

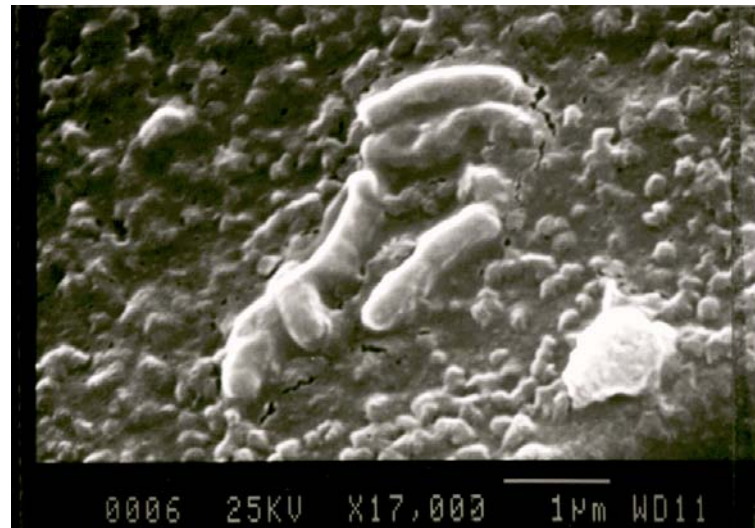


European primary & secondary metal resources have a significant potential

Biohydrometallurgy



- > Biohydrometallurgy can be defined as the field of applications resulting from the control of natural (biochemical) processes of interactions between microbes and minerals to recover valuable metals



A mature industrial activity



Cerro Colorado (Chile)
BHP- Billiton



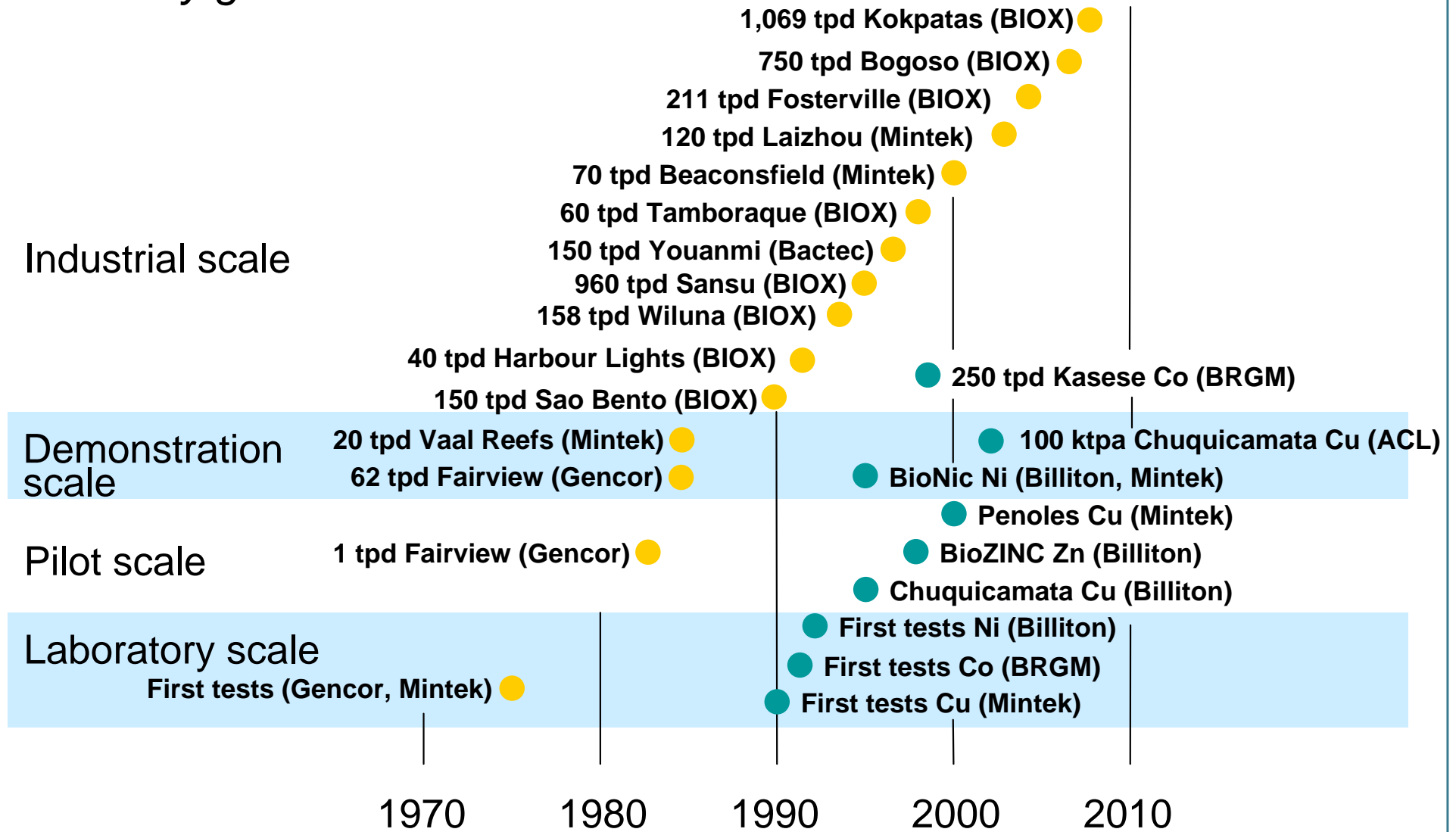
Kasese plant in Uganda (Cobalt) - BRGM



Concentrate tank bioleach development



...Steady growth...



- Refractory gold sulphide
- Base metal sulphide

Why to support biohydrometallurgy implementation in Europe?



European Commission is looking for “Radical changes in the “basic materials” industry (excluding steel) for cleaner, safer and more eco-efficient production”

- > Biohydrometallurgy covers technologies with very relevant characteristics
- > Biohydrometallurgy has reached maturity
- > Europe has many resources that look suitable targets
- > Europe has many of the required skills
(but scattered and not focused on European targets)

BioMinE project objectives



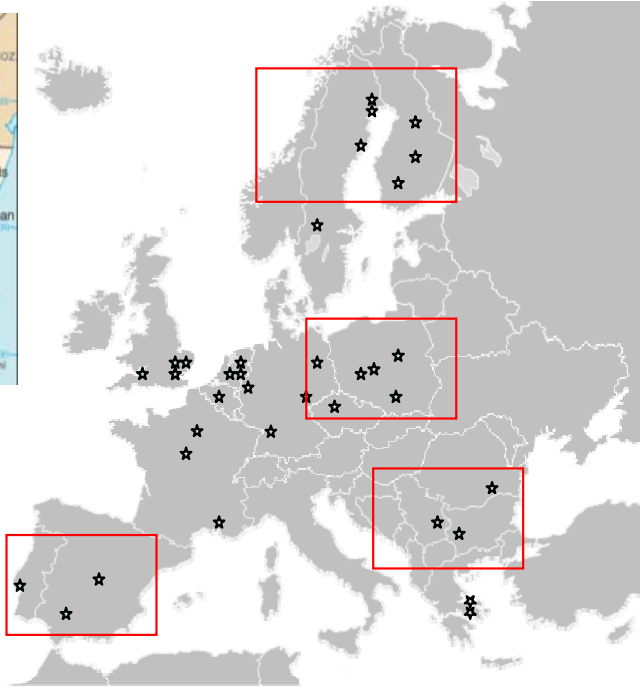
- > To improve and optimally fit biotechnologies suitable for treatment of European resources
- > To integrate European expertise to achieve biohydrometallurgical technology breakthroughs
- > To develop and demonstrate technologies that can be commercialized

BioMinE Integrated Project

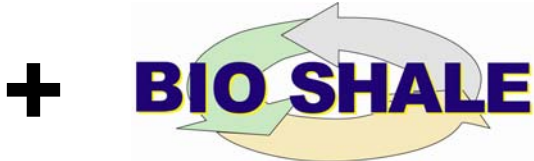


- > 17M€ budget
- > 11.6 M€ EU contribution
- > 4 years, from Nov 2004 to Oct 2008
- > General Coordinator BRGM
- > Reviewed by external experts every year
- > Adjustment of the work programme every year

Partnership



- 37 partners - 14 countries from Europe and South Africa including
- 13 industrial companies
- 16 universities
- 8 research organizations



European Resource Assessment



Neves Corvo



BOLIDEN

Aitik



Aguablanca



KGHM

POLSKA MIEDŹ S.A.

Lubin



Boliden



Aljustrel



Bor

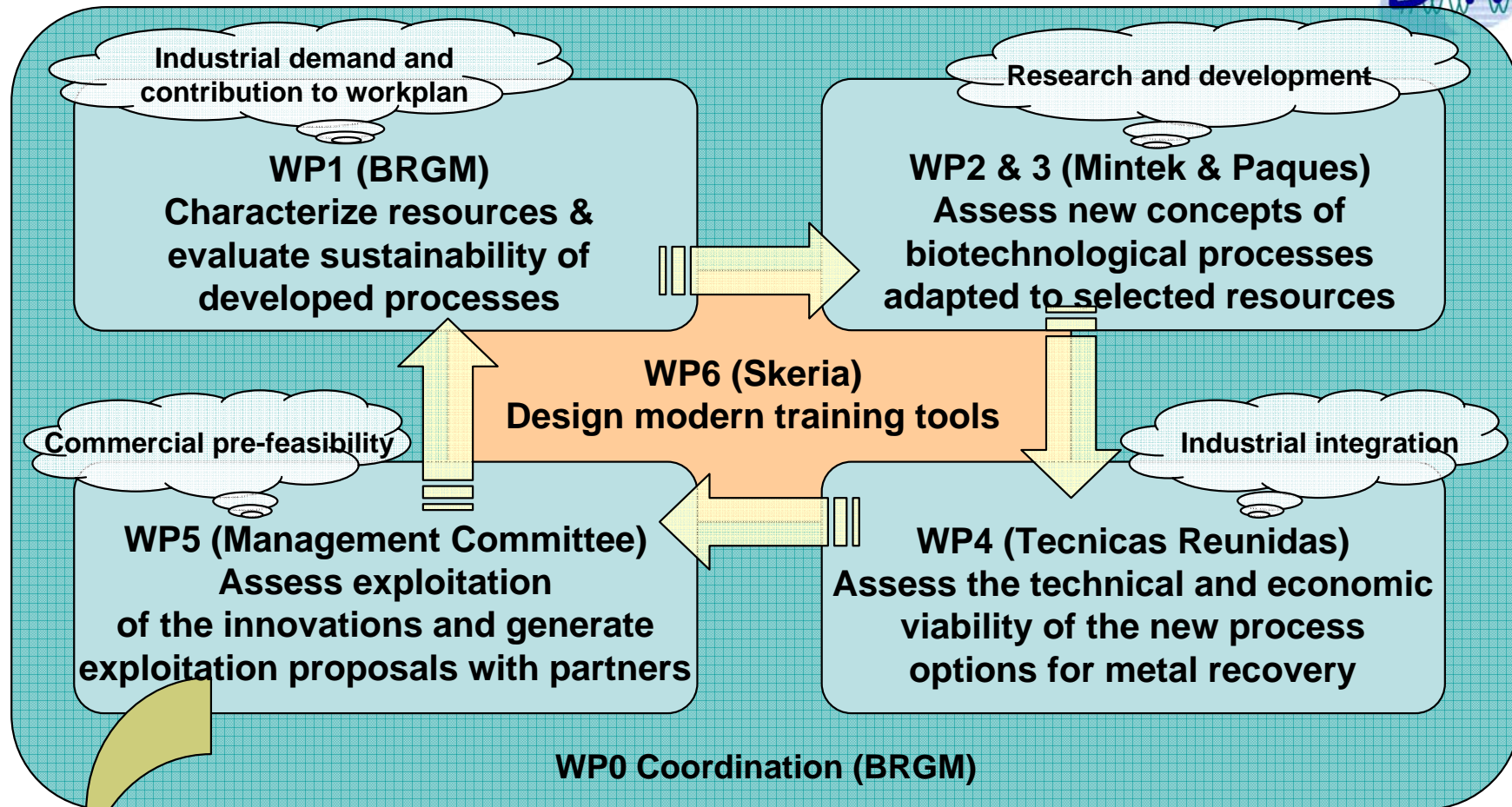
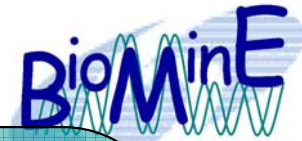


EUROZINC
MINING CORPORATION

lundin mining



BioMinE project structure and rationale



- Commercial demonstration
- Commercial agreements between partners (process development and applications)
- Commercial spin-offs (e.g. monitoring tools and equipment)
-

Screening of the European primary resources

WP1



- > Known European resources are relatively marginal in value and in size
- > The best remaining opportunities are complex ores
- > Biohydrometallurgy which has been developed on the border of conventional technologies has good opportunities in Europe
- > The potentially suitable (bio)technologies have to be assessed individually on selected resources

> Performances and optimization of bioleaching on selected European resources

- Direct bioleaching on copper and copper polymetallic resources
- Indirect and direct bioleaching on zinc and zinc polymetallic resources
- Treatment of secondary resources, tailings and slags

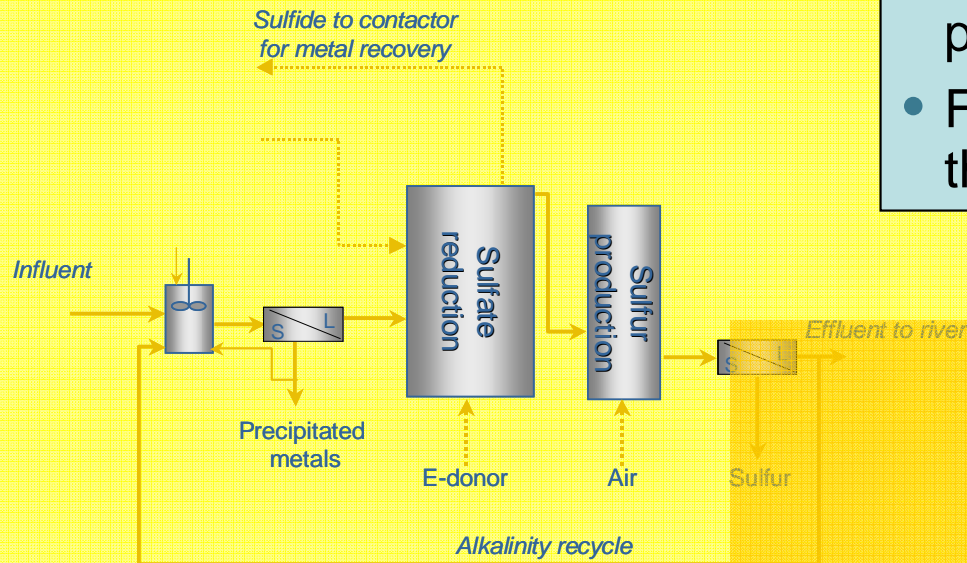
> Microbial exploration and studies

- Selection of suitable microorganisms
- Better understanding of the microbial processes
- Better command of the molecular tools

Metal recovery by biological sulfate reduction (WP3)

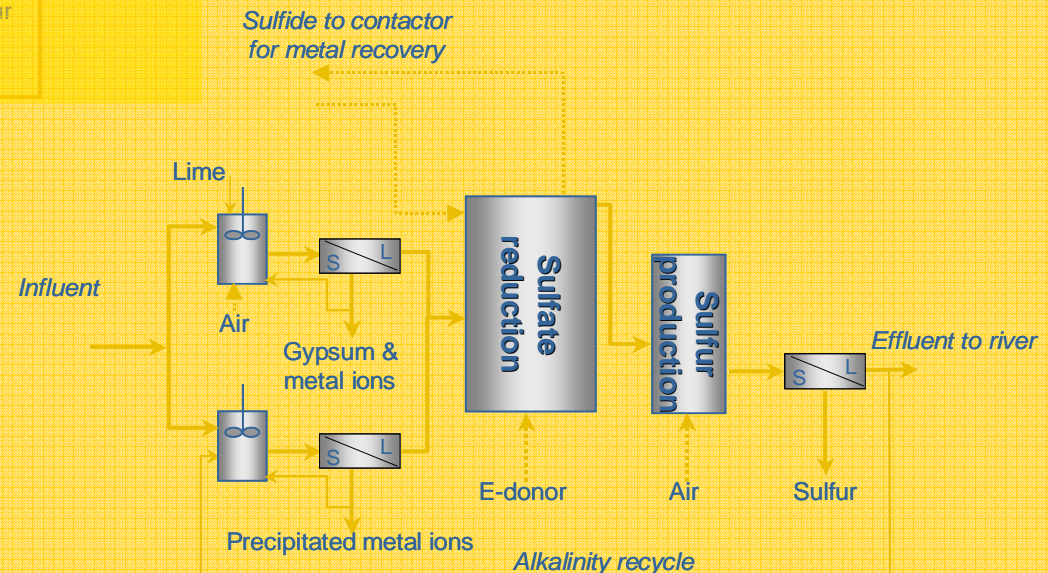


Alternative A



- Investigations on energetic sources and optimization of the process
- Flowsheet alternatives to increase the profitability

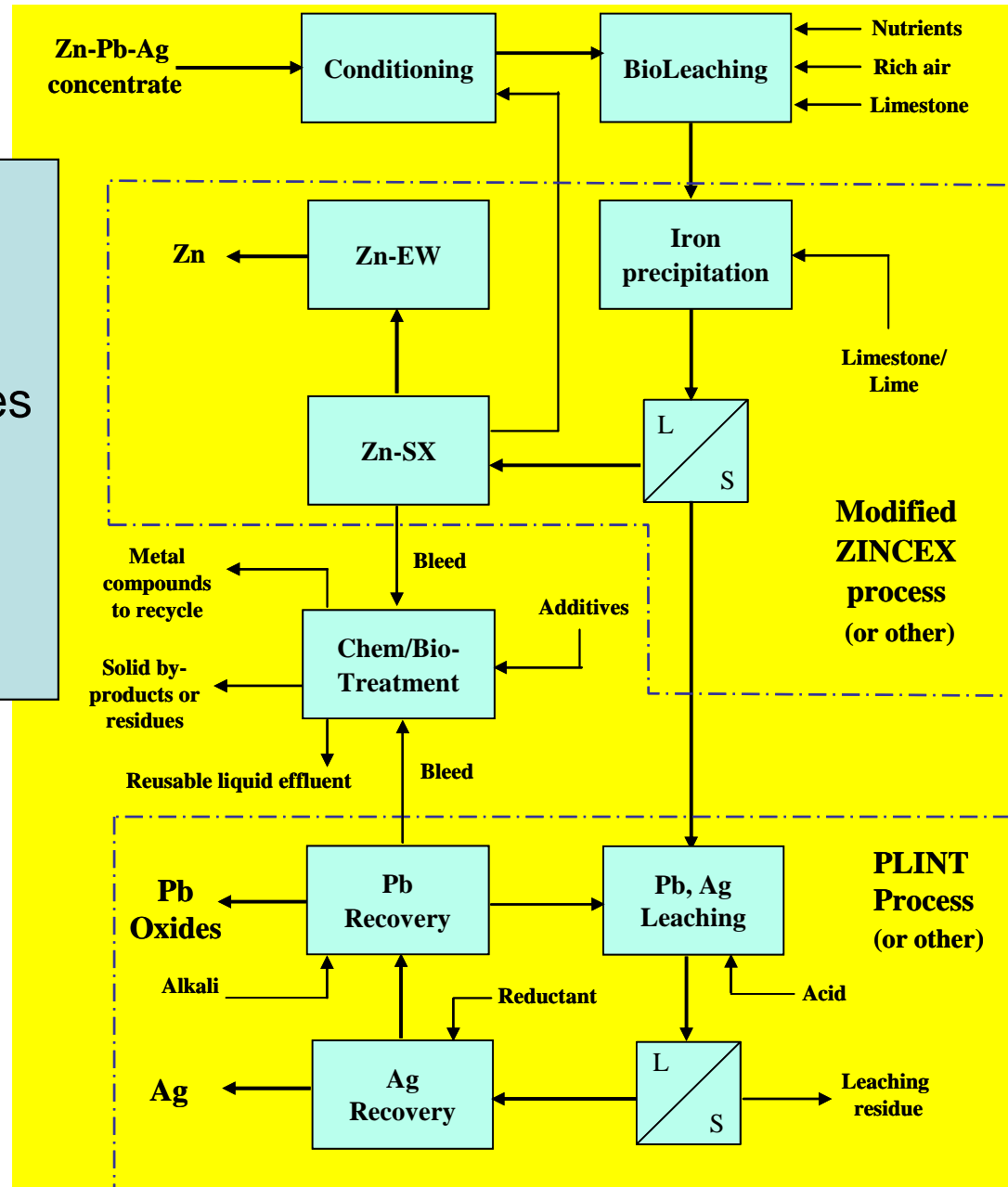
Alternative B



- Monitoring and quality assessment of effluent treatments

Full process design (WP4)

- Process evaluations have been carried out on innovative sequences of treatments like indirect bioleaching applied to zinc complex resources



Progress per objective



1 – Identification of relevant resources in Europe	✓
2 – Identification of biotechnologies relevant to screened European resources	✓
3 – Testing and optimization of biotechnologies on European resources	In progress
4 – Integration of biohydrometallurgical expertise in Europe	✓
5 – To carry out demonstration operations on benchmark resources	In preparation

Stay tuned.... <http://biomine.brgm.fr>