



# RAW MATERIALS UNIVERSITY DAY

## Future, needs and opportunities

### POLYMETALLIC SULPHIDE ORES

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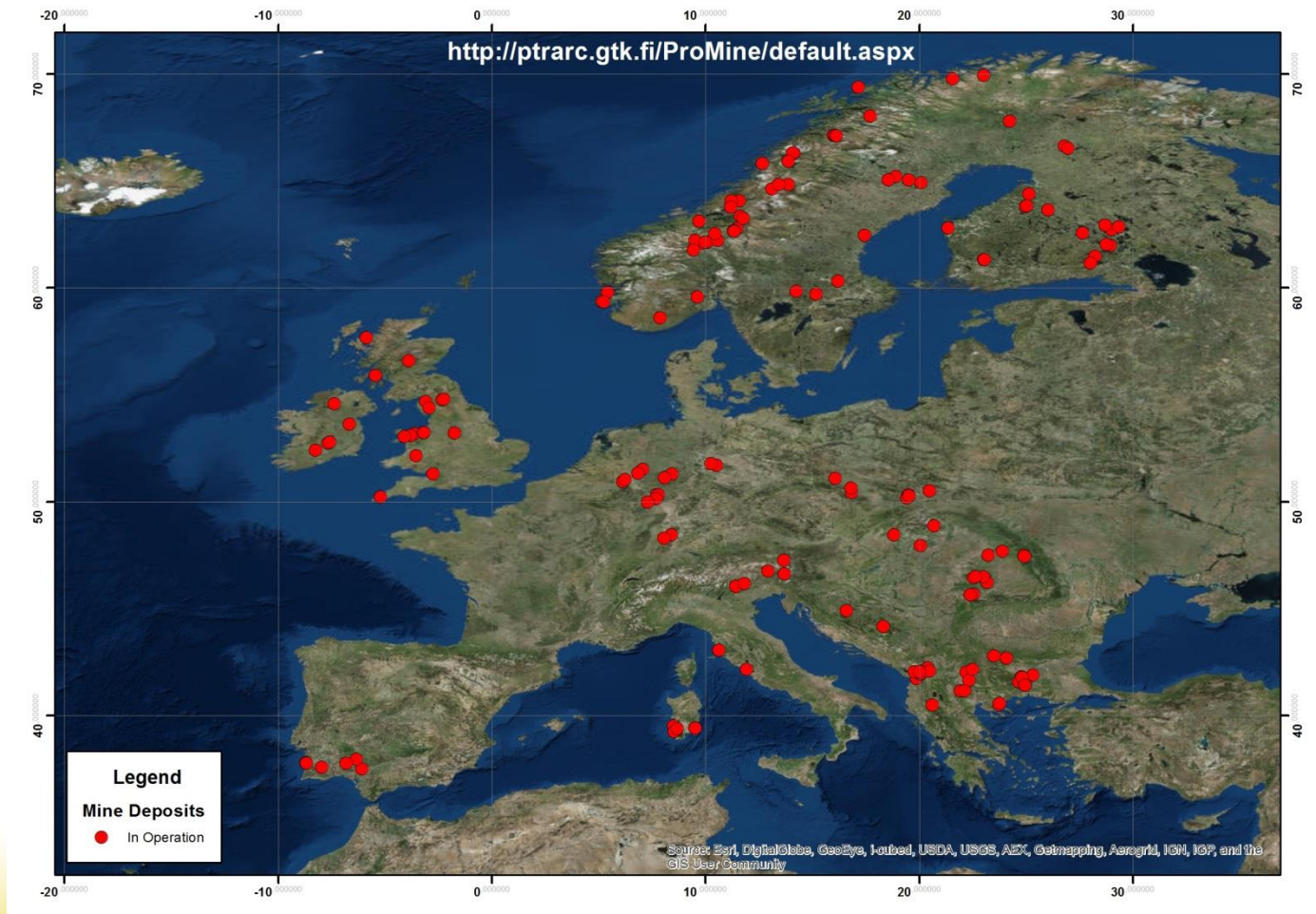
National and Kapodistrian University of Athens  
Faculty of Geology and Geoenvironment



# POLYMETALLIC SULPHIDE ORES

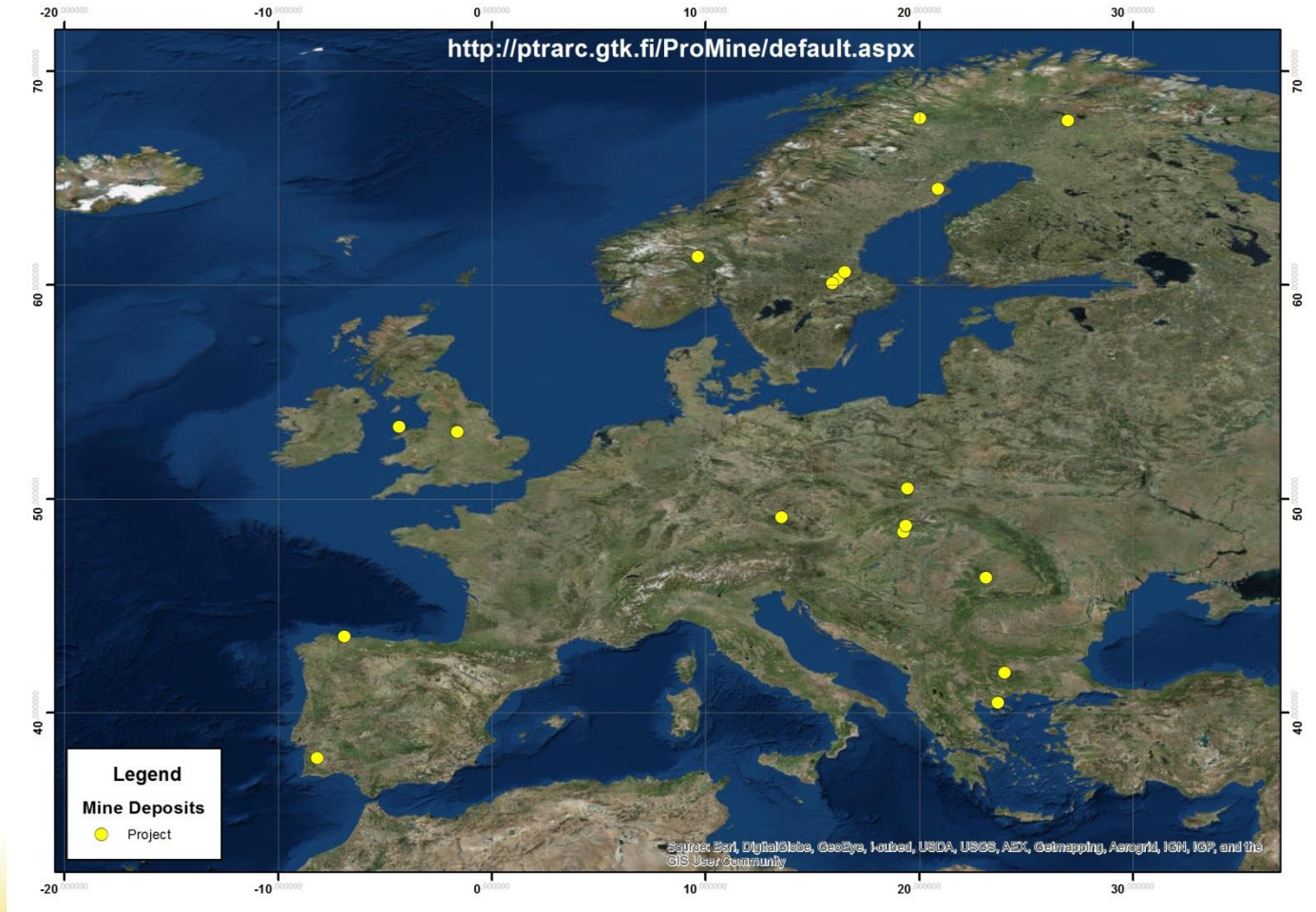
A mineral deposit with three or more metals in commercial quantities; common metals include Cu, Pb, Zn, Fe, Mo, Au, and Ag.

# EUROPE - POLYMETALLIC SULPHIDE MINES IN OPERATION



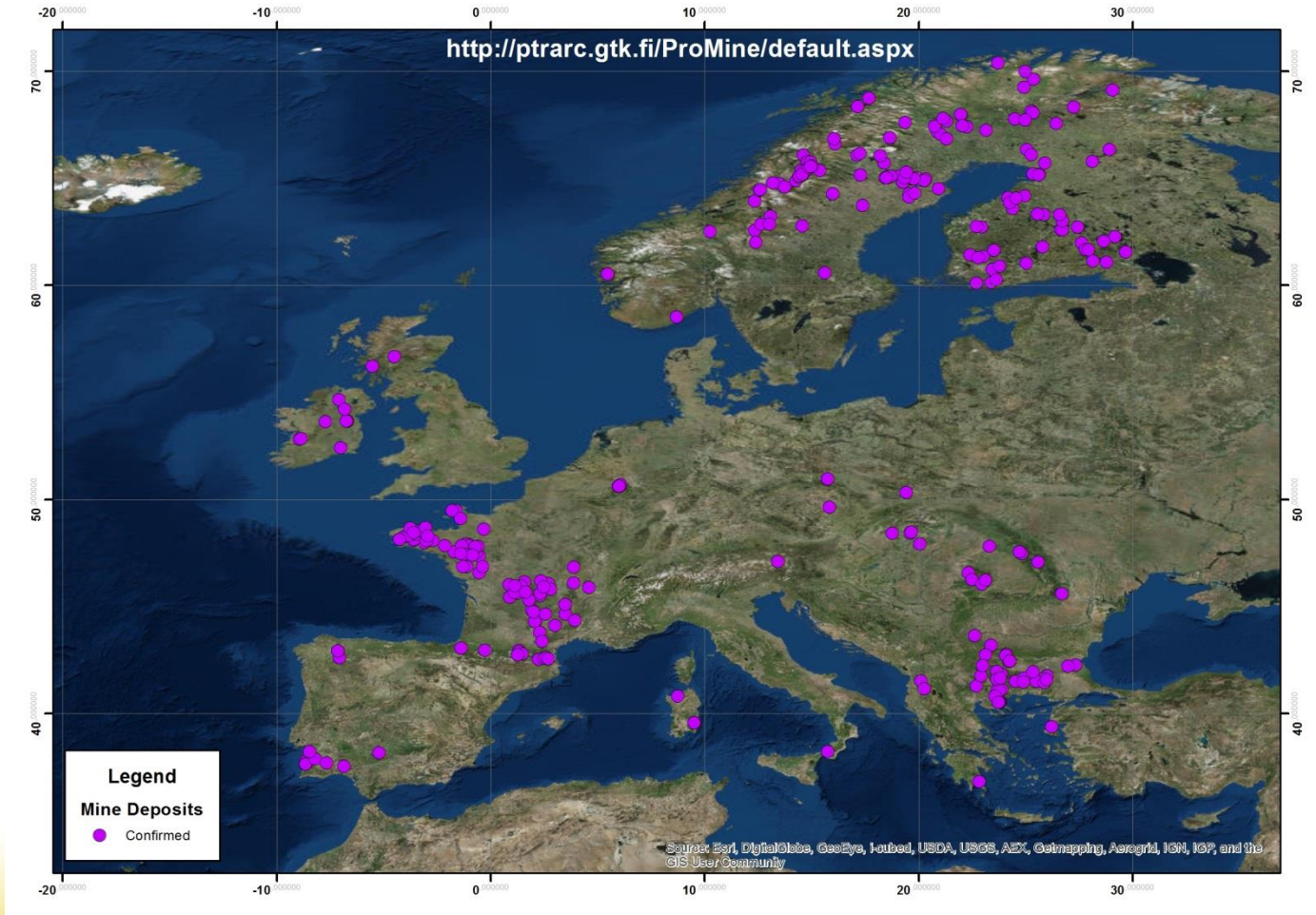
RESOURCES FUTURE MINING UNIVERSITY MINERAL  
RAW MATERIALS  
GEOLOGY GEOENVIRONMENT STUDENTS DAY  
SUSTAINABLE INNOVATION ENGINEERS UNDERGROUND  
INDUSTRY METALLURGY DEVELOPMENT

# EUROPE - POLYMETALLIC SULPHIDE MINES UNDER CONSTRUCTION



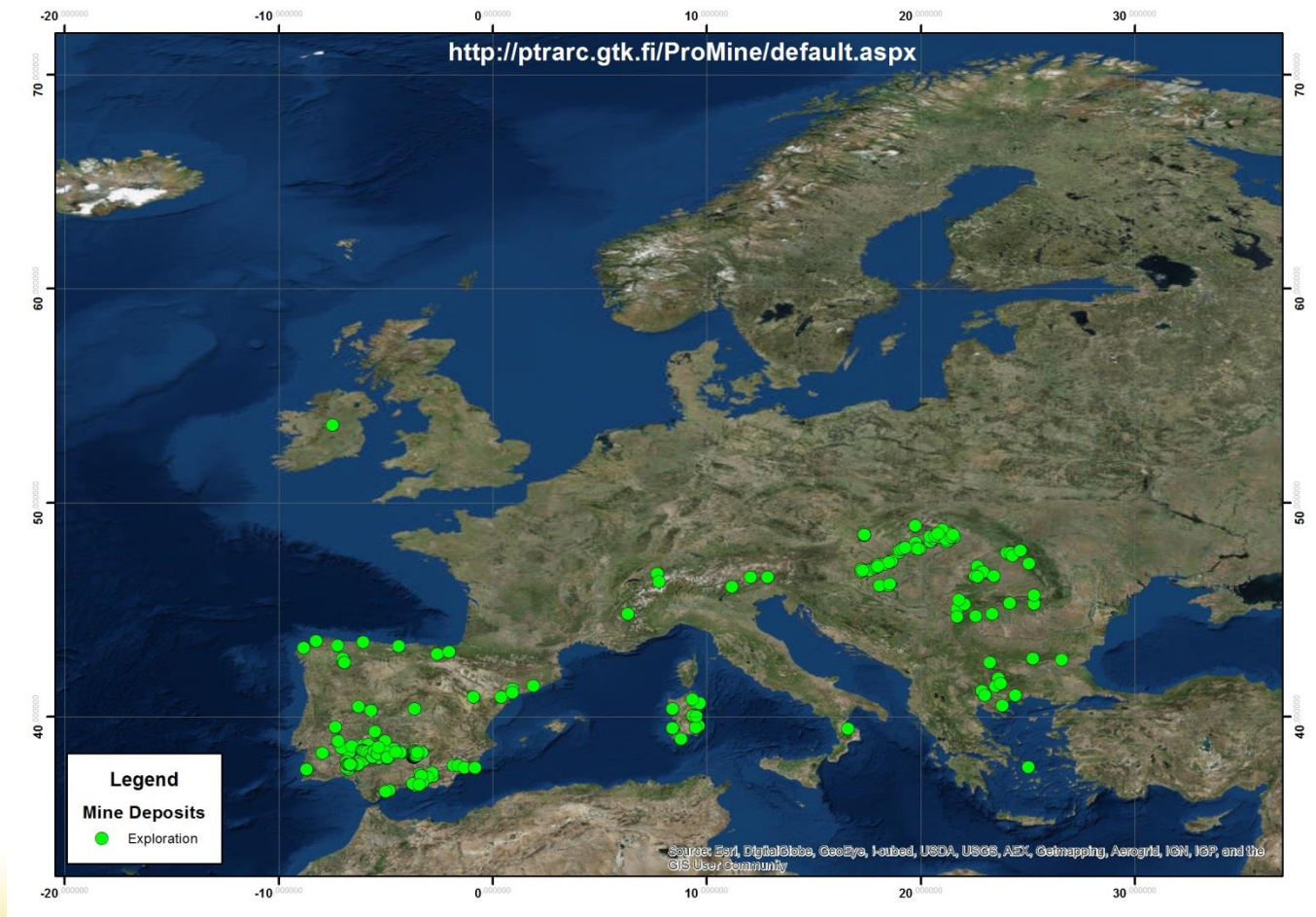


# EUROPE - POLYMETALLIC SULPHIDE MINES UNDER DEVELOPMENT

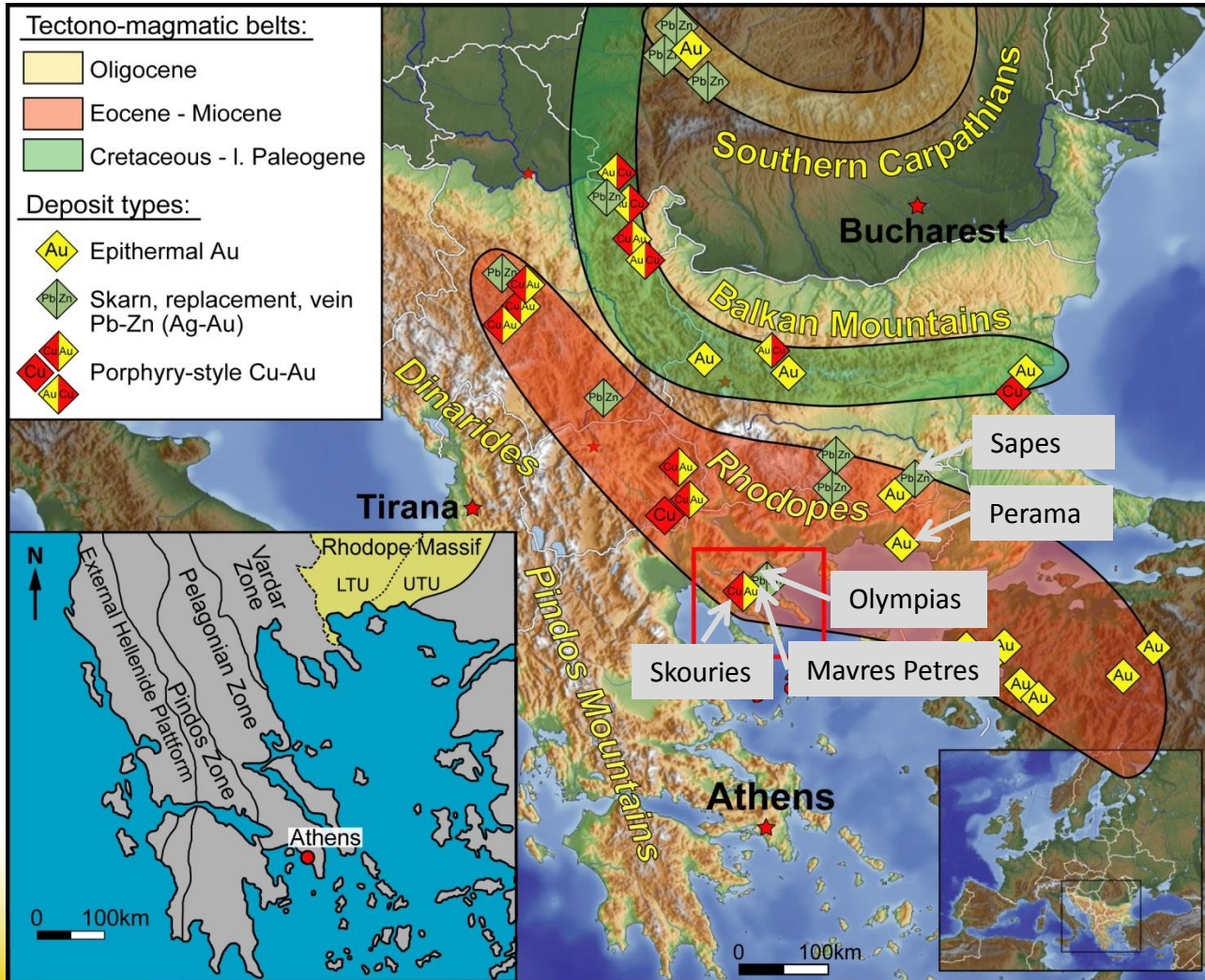


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# EUROPE - POLYMETALLIC SULPHIDE ORES UNDER EXPLORATION



# POLYMETALLIC SULPHIDE MINES IN NORTH GREECE



- Rhodope Zone: Eocene – Miocene magmatic belt superimposed on pre-Mesozoic metamorphic basement
- Magmatic-hydrothermal deposits within both Tertiary intrusive/stratified units (porphyry, epithermal systems) and in older sequences (carbonate replacement)

(From Hahn et al., 2010)



# Sapes Mining Project





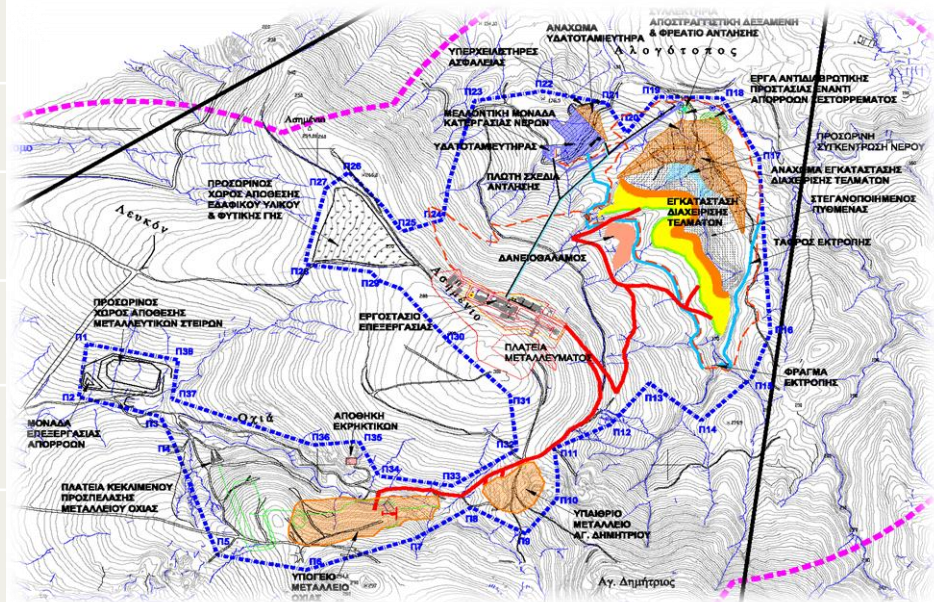
# Sapes Mining Project - Location





# Sapes Mining Project - Overview

Deposit Type	Cu – Au epithermal
Mine Life	11 years
Mining method	Oxia mine Underground Drift & Fill Agios Dimitrios Open Pit
Mining Rate	0,2 Mtpa
Reserves	1.3 Mt @ Cu: 26,1g/t, Au: 15.1g/t
Processing	Flotation (Cu/Au conc.) & Gravity circuit (Au doré)



## Highlights

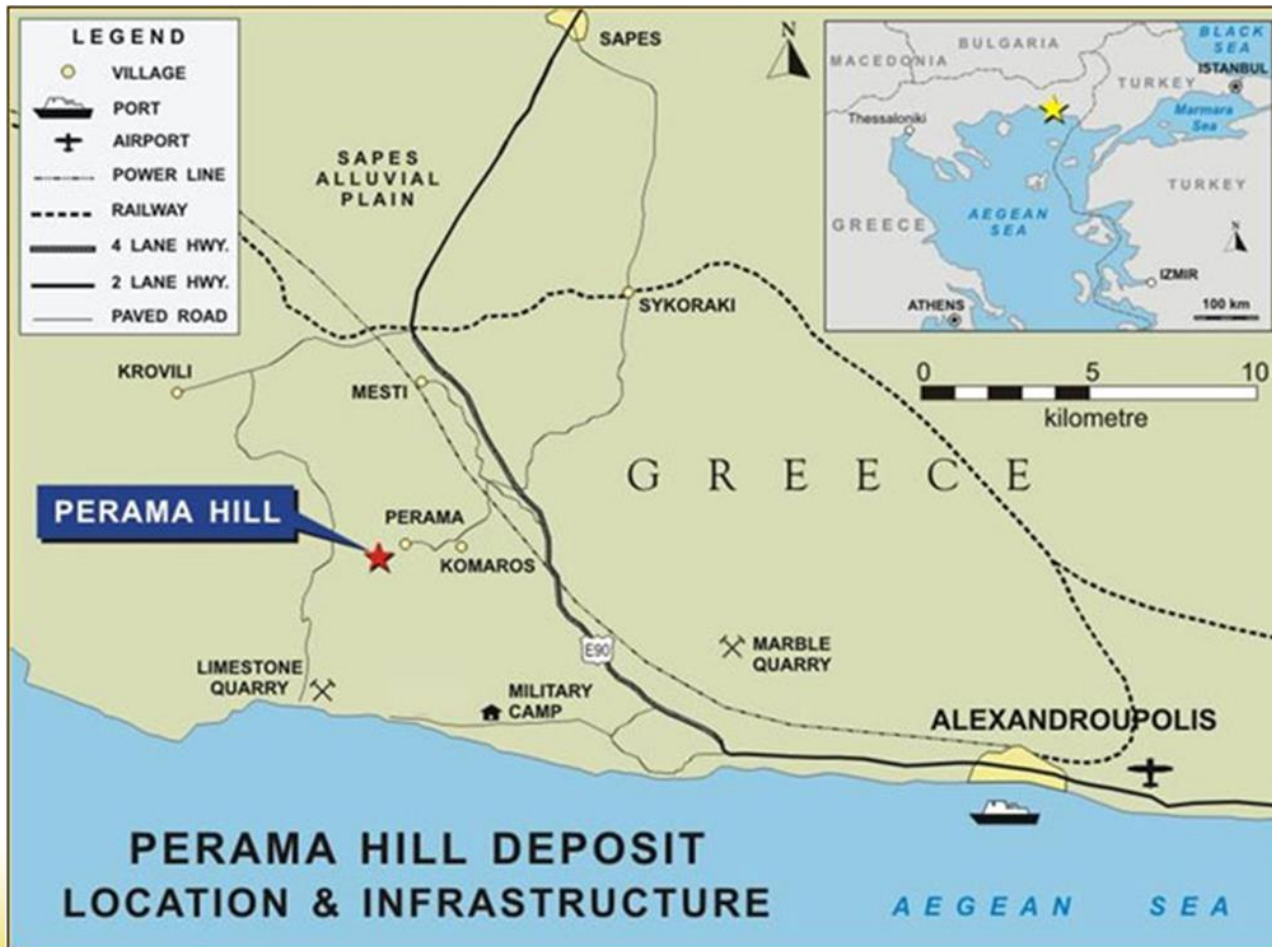
- Approval of the PEIA issued June 2012
- EIA submitted to the Ministry of Environment December 2012



# Perama Hill Mining Project



# Perama Hill Mining Project - Location





# Perama Hill Mining Project - Overview

Deposit Type	Disseminated epithermal gold-silver
Mine Life	8 years
Mining Rate	1.25 Mtpa
Reserves	9.7 Mt @ Au: 3.13g/t
Gold Production	110,000 oz./year
Silver Production	85,000 oz./year
Processing	Conventional CIL
Recoveries	90% gold ; 60% silver



## Highlights

- Approval of the PEIA issued in February 2012
- EIA submitted to the Ministry of Environment on March 2012

# Kassandra Mines



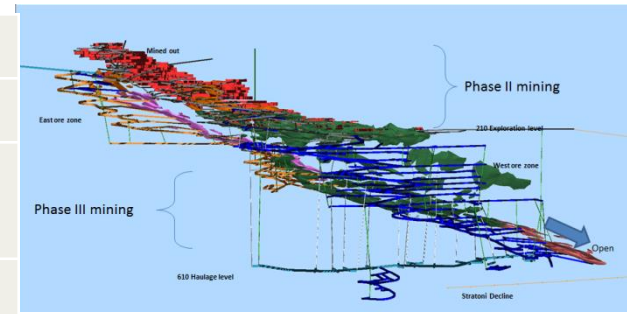


# Olympias Mining Installations



# Olympias Mining Installations - Overview

Deposit Type	Replacement mixed sulphide
Mine Life	25 years
Reserves	2,4 Mt old tailings @ 3,4 g/t Au 11,5 Mt ROM @ Pb:4,6%, Zn:6,1%, Au: 9,0g/t, Ag: 137,5g/t
Mining Rate	Phase I – Tailings – 800 ktpa to 1M tpa Phase II – Underground – 450 ktpa Phase III – Underground Expansion – 850 ktpa
Processing	Phase I - Flotation (AsPy) Phase II – Flotation (AsPy ,Pb/Ag, Zn conc.) Phase III – Flotation + Gold plant
Recoveries	Pb/Zn/Ag/Au in concs.: ±90%; Met plant: +/-90%



## Highlights

- Phase I processing underway
- Underground refurbishment & development underway
- Recruitment underway

## Optimisation

- Continue with phased development plan
- Copper - gold metallurgy at Madem Lakkos
- Update current mine design based on new resource model

## Upside

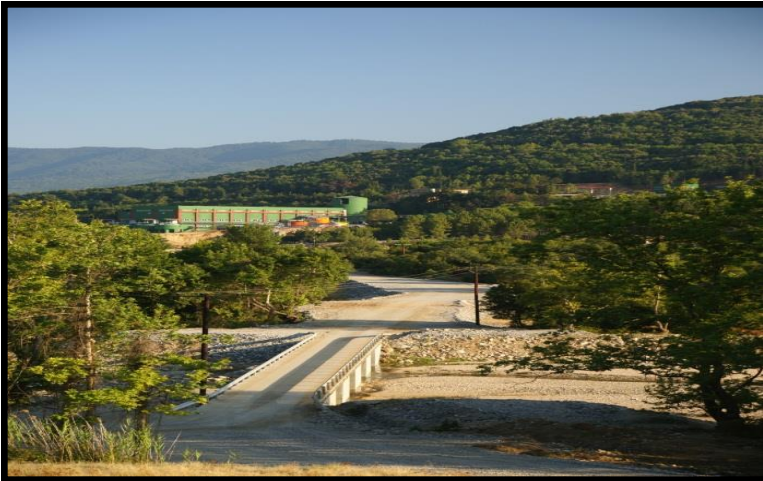
- Ore body open at depth
- Potential to add significant resource ounces



# Olympias Mine



# Olympias Mill



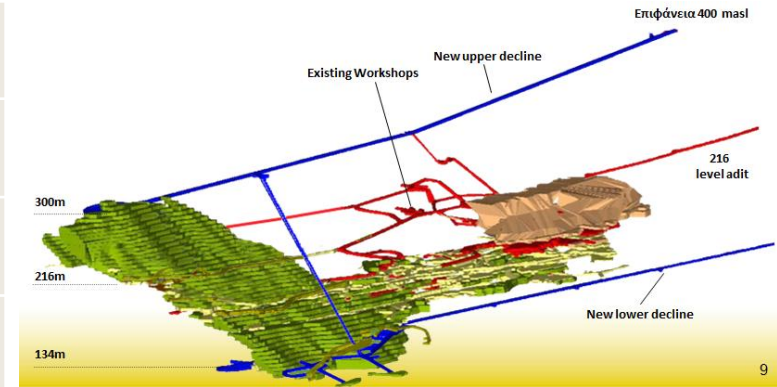


# Mavres Petres – Stratonis Mining Installations



# Mavres Petres/Stratoni Mining Installations - Overview

Deposit style	Replacement mixed sulphides
Mining Method	U/G Drift & Fill
Mine Life	4 years (2017)
Reserves	0,9Mt @ Zn: 11.5%, Pb: 6.9% and Ag: 184g/t
Production	±235kt ROM
Processing	Flotation (Pb-Ag and Zn conc.)
Recoveries	92% Pb and Zn; 83% Ag to Pb concentrate



## Highlights

- >100 yrs of historic production
- Cash flow positive

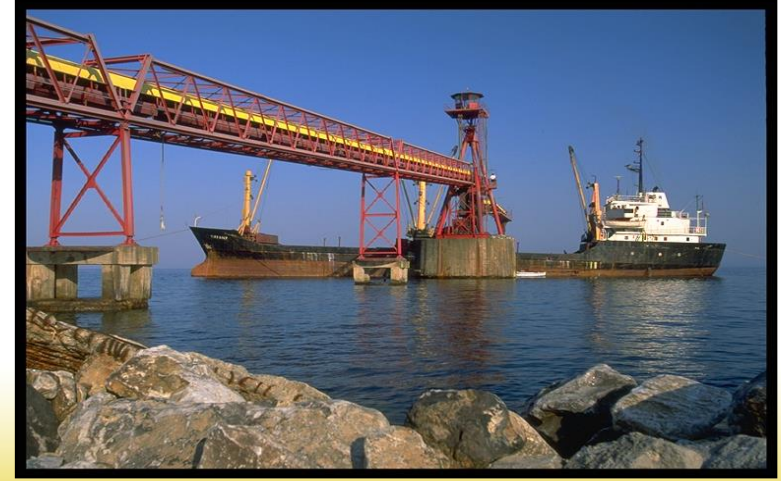
## Upside

- Potential for an additional 2 years of mine life
- Huge exploration potential within area with drilled and drill ready targets

# Mavres Petres Mine



# Stratoni Mill & Port Facilities



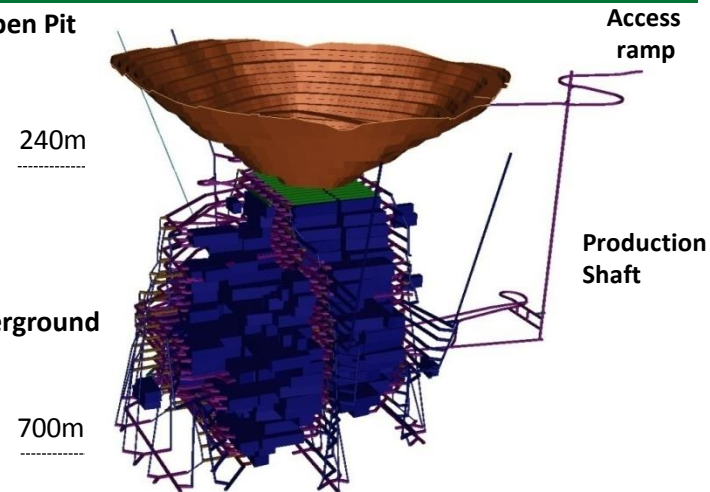
# Skouries Mining Installations



# Skouries Mining Installations - Overview

Deposit Type	Cu - Au porphyry
Mining Rate	8Mtpa Open Pit ; 4.4Mtpa Underground SLOS
Mine Life	27 years , (7 y s open pit 20 y s underground)
Strip Ratio	0.7 : 1.0 (w:o)
Reserves	148 MT 0.76 g/t Au, 0.57 % Cu
Production	~140,000oz Au, ~30,000kt Cu pa Open Pit ~100,000oz Au, ~22,000t Cu pa Underground
Processing	Flotation (Cu/Au conc.) & Gravity circuit (Au doré)
Recoveries	LOM average ~84% Au and ~91% Cu

1. Open Pit



2. Underground



## Highlights

- All permits issued (EIS, Technical Study, Forestry, Installation for electromechanical equipment)
- Building permit still pending



# Skouries Mine

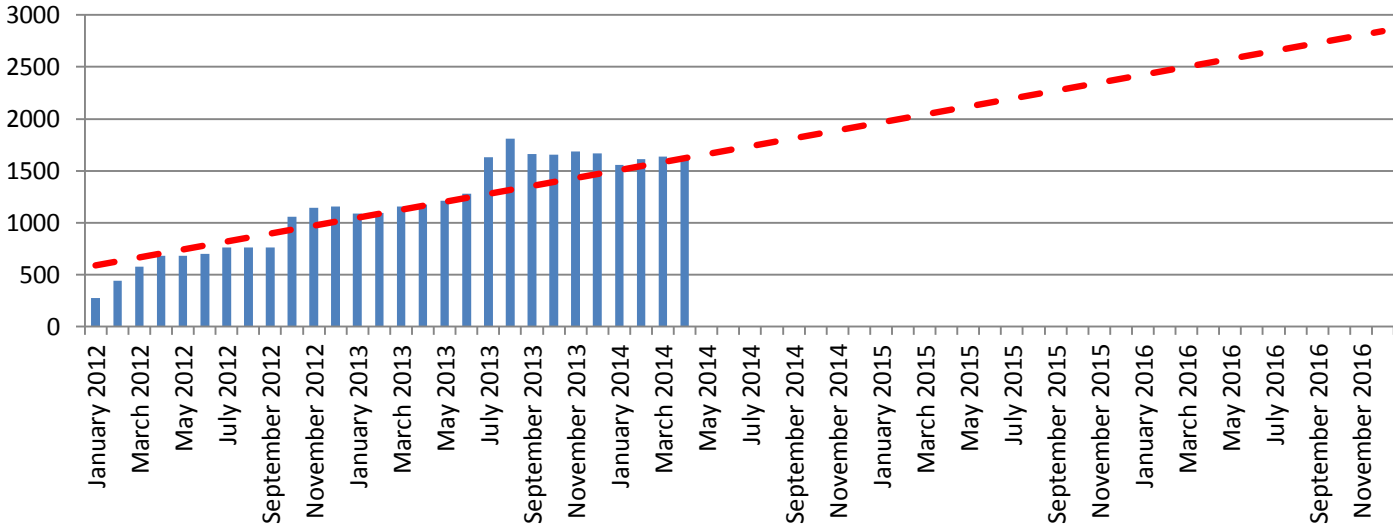


# Skouries Mill



# Kassandra Mines – Manpower (today 1643)

**No. of Personnel (direct + contractors)**



## **Kassandra Mines Manpower – Scientific personnel (10%)**

- Mining & Metallurgical Engineers – **33**
- Geologists – **26**
- Chemical Engineers
- Electrical Engineers
- Mechanical Engineers
- Surveyor Engineers
- Civil Engineers
- Chemists
- Foresters
- Archaeologists
- Occupational Doctors

## **Mining Engineer – Duties & Responsibilities**

- Occupational Health & Safety
- Mine Planning & Supervision
- Selection of mining method and mining rate to optimize business
- Evaluation & selection of mobile equipment Fleet
- Evaluation & selection of process equipment
- Evaluation & proposals for improving performance
- SHE & QA-QC Management Systems
- Human Resources management
- Training
- Annual budget - Monitoring the costs
- Contractors management
- Reporting
- Cooperation with authorities
- Legislation and specifications
- Public relations
- National and European research projects
- Cooperation with Universities, Research Institutes & Associations

## Geologist – Duties & Responsibilities

- Occupational Health & Safety
- Design, coordination and supervision of surface & underground geological and geotechnical drill programs
- Data management (core logging, face mapping & sampling, chemical analyses, etc)
- Data interpretation and evaluation (dike model, structural model, ore zones)
- Create 3D block models of the mineralized deposit
- Grade quality control to minimize dilution and ore losses
- Provide regular updates of the block model for mine design and scheduling
- Design, establishment and operation of samples preparation laboratory
- Ensure timely and effective project activities in line with budget and forecast
- Reporting
- SHE & QA-QC Management Systems
- Human Resources management
- Training
- Annual budget - Monitoring the costs



**Thank You**  
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