



Coordinating and integrating state-of-the-art  
Earth Observation Activities in the regions of  
North Africa, Middle East and Balkans  
and Developing Links with GEO related initiatives  
toward GEOSS

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## **GEO-CRADLE Regional Event – Access to raw materials**

**Veronika Kopačková, Czech  
Geological Survey**

**EO-MINERS**



*Morocco&Algeria  
17-23 October 2016*





## EO-MINERS (2010-2013)



### **EO-MINERS was a Research and Technological Development project funded by the European Commission**

- To help **EC improve its raw material policy** and better exploiting mineral resources from the European territory
- To **demonstrate how to improve the capacity of Europe** in implementing new mining sites
- To **improve interaction** between the mining industry and society

**Scientific objective 1:** Define **environmental, socio-economic, societal** and sustainable development **criteria and indicators** to be possibly dealt with **EO**

**Scientific objective 2:** Demonstrate the **capabilities of integrated EO-based methods and tools** in:

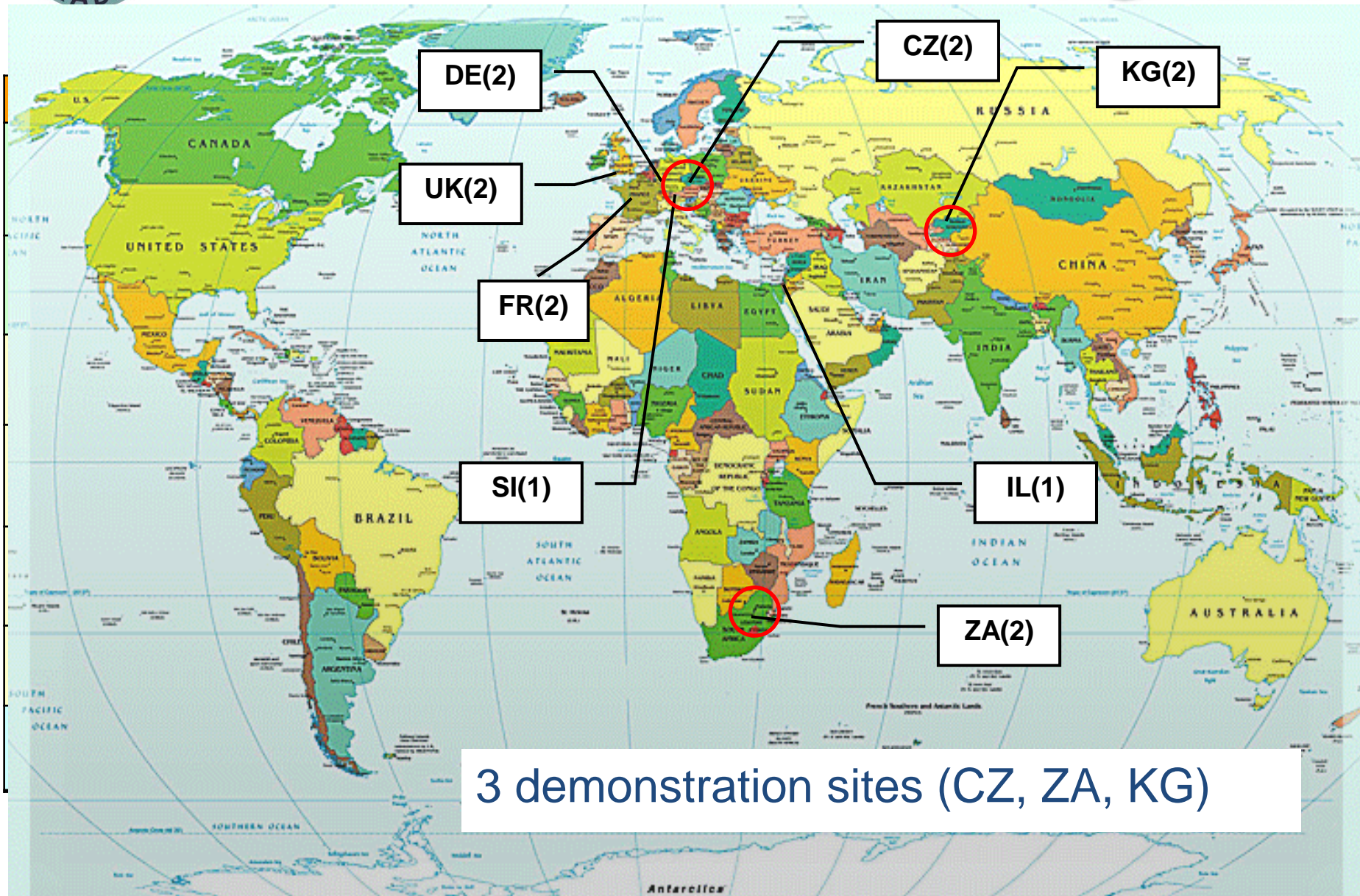
- monitoring,
- managing
- Contributing to **reducing the environmental and societal footprints** of all phases of a mining project

**<http://www.eo-miners.eu/>**



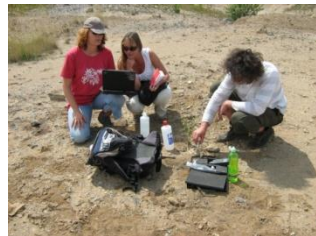


# EO-MINERS (2010-2013)





Expert knowledge

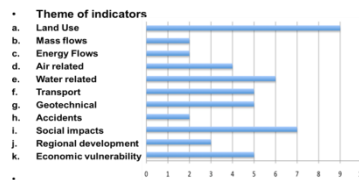


On-site investigations

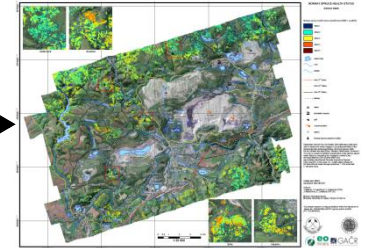


Stakeholder interviews

## Indicators



## EO methods and tools



EO-based monitoring products



Dialogue workshops  
Stakeholder feedback



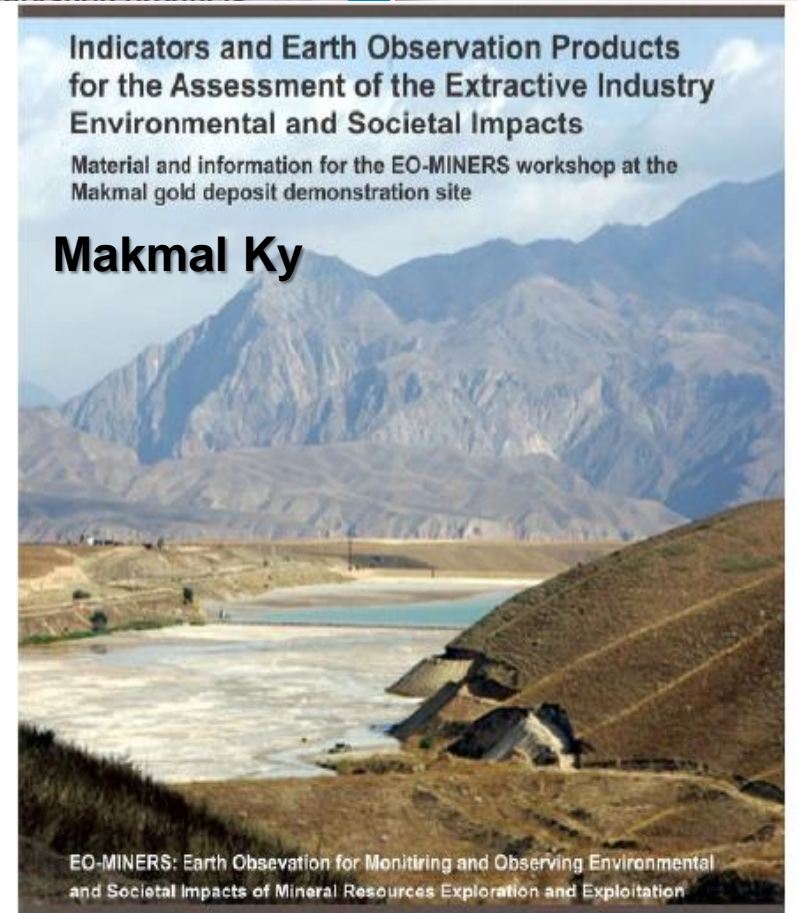
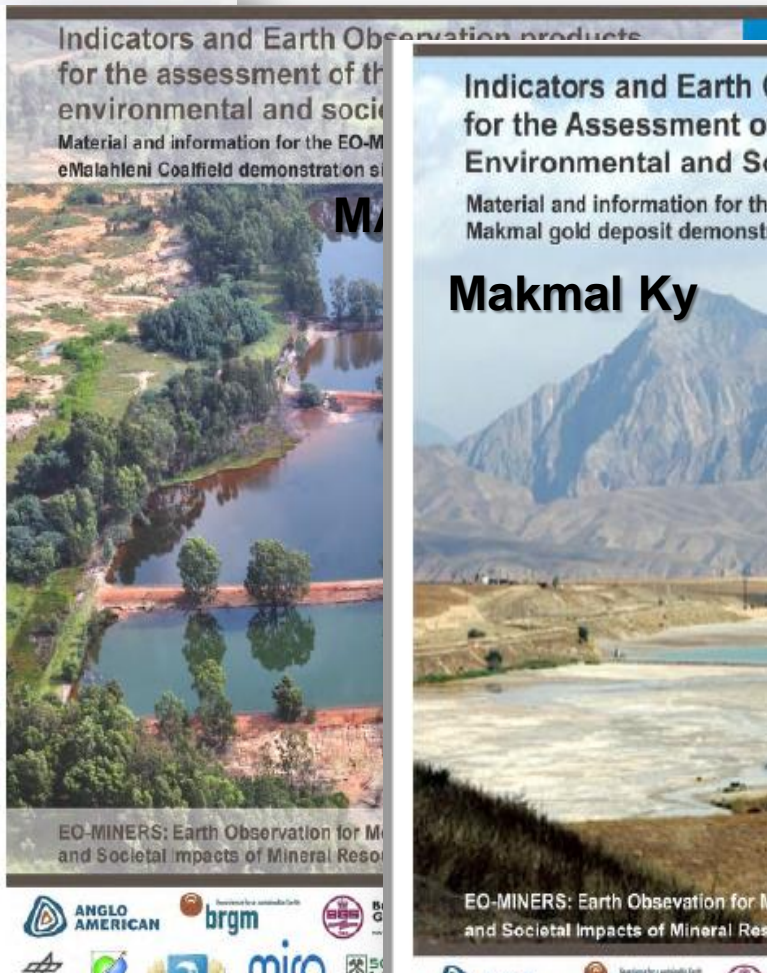
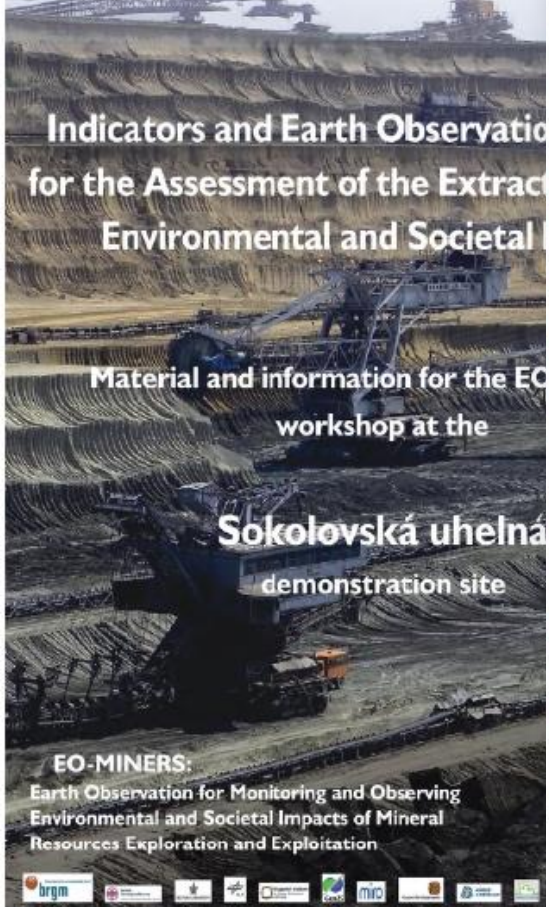


# EO-MINERS INDICATORS

Causes	Environmental issues	Indicators	Representative EO-MINERS result
AMD	Water quality & soil properties	<b>Water Quality</b> E4: Acid drainage generation potential (distribution of sulphidic iron minerals)	<b>Figures:</b> 5 and 8 - 11
Windblown coal dust, gaseous emissions	Atmospheric pollution	<b>Air quality and other nuisances</b> D1: Aerosols (particle concentration in off-site air)	<b>Figures:</b> 15 – 20
AMD and Mining	Land degradation / loss	<b>Land Use</b> A1: Total land-use by mining and milling (topographic footprint) A4: Residential land-use (residential developments around mining areas) A6: Sites set aside, protected areas (nature reserves, wetlands, sites of spiritual value and similar) A8: Recultivation success on mined-out areas and waste/spoil heaps (designated mining areas covered by specific vegetation) A9: Soil fertility of remediated mine areas	<b>Figures:</b> 5 and 12 13 13 and 14 5-12, 19 and 20 5, 8, 11, 12, 14 and 16
AMD sources/buffer material	Water quality & soil properties	<b>Mass Flow</b> B1: Waste volumes generated (volume change versus amount of marketable product)	<b>Figure:</b> 12
Overburden instability	Landslide	<b>Geotechnical hazards and accidents</b> G3: Dam stability (water saturation in retaining dams)	<b>Figures:</b> 6, 7 and 14
Self-combustion of coal	Coal fires	<b>Geotechnical Hazards and Accidents</b> G4: Underground and mining waste deposit fires (number, duration and area affected)	<b>Figures:</b> 13

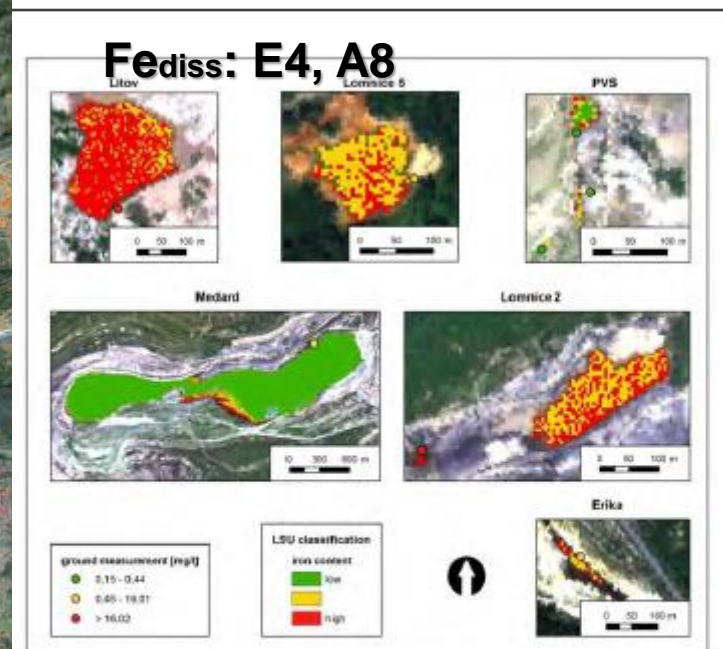
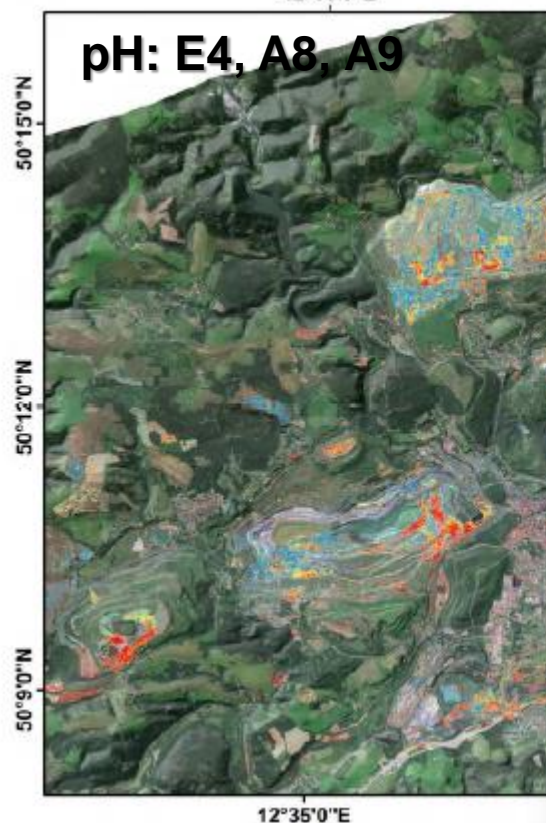
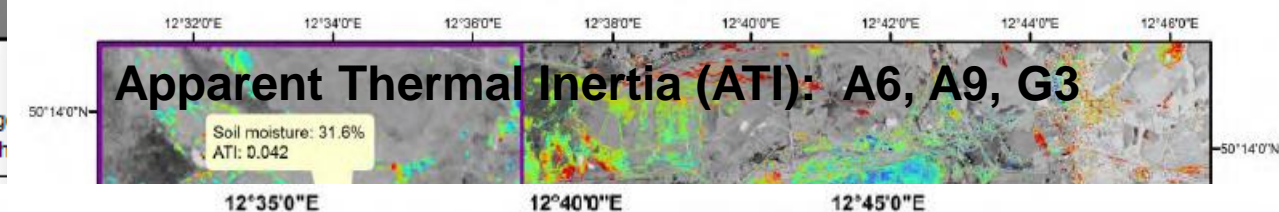


## Sokolov Cz





Causes	Environmental issues	Indicators	Representative EO-MINERS products
AMD	Water quality & soil properties	Water Quality E4: Acid drainage g (distribution of sulphur)	
Windblown coal dust, gaseous emissions	Atmospheric pollution	Air quality D1: Aerosols (air)	
AMD and Mining	Land degradation / loss	Land Use A1: Total (topographic) A4: Residual development A6: Sites reserves, (similar) A8: Recultivated and waste areas covered A9: Soil fertility	
AMD sources/buffer material	Water quality & soil properties	Mass Flow B1: Waste versus an	
Overburden instability	Landslide	Geotechnical G3: Dam (dams)	
Self-combustion of coal	Coal fires	Geotechnical G4: Underground and mining waste deposit fires (number, duration and area affected)	13



(c)

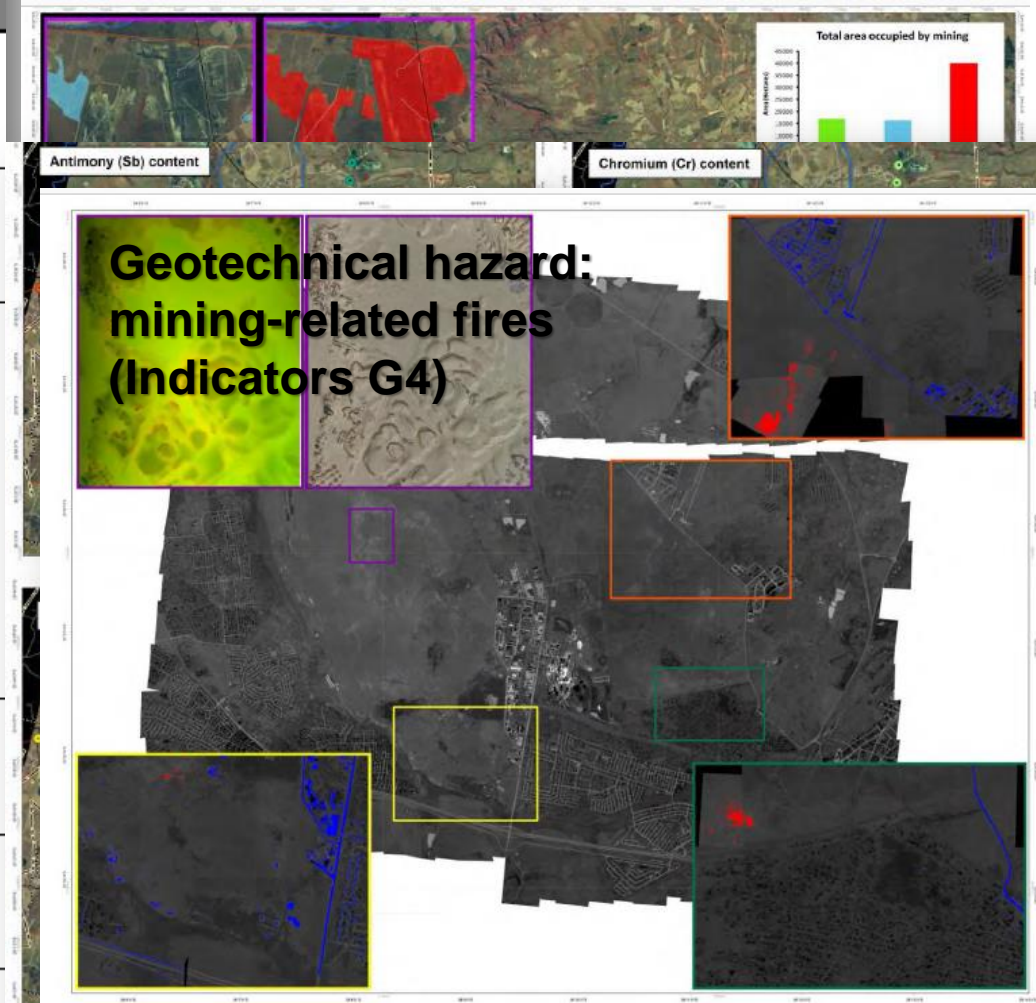


# MALAHLENI: Indicators and products



Causes	Environmental issues	Indicators
AMD	Water quality & soil properties	<b>Water Quality</b> E4: Acid drainage generation potential (distribution of sulphidic iron minerals)
Windblown coal dust, gaseous emissions	Atmospheric pollution	<b>Air quality and other nuisances</b> D1: Aerosols (particle concentration in off-site air)
AMD and Mining	Land degradation / loss	<b>Land Use</b> A1: Total land-use by mining and milling (topographic footprint) A4: Residential land-use (residential developments around mining areas) A6: Sites set aside, protected areas (nature reserves, wetlands, sites of spiritual value and similar) A8: Recultivation success on mined-out areas and waste/spoil heaps (designated mining areas covered by specific vegetation) A9: Soil fertility of remediated mine areas
AMD sources/buffer material	Water quality & soil properties	<b>Mass Flow</b> B1: Waste volumes generated (volume change versus amount of marketable product)
Overburden instability	Landslide	<b>Geotechnical hazards and accidents</b> G3: Dam stability (water saturation in retaining dams)
Self-combustion of coal	Coal fires	<b>Geotechnical Hazards and Accidents</b> G4: Underground and mining waste deposit fires (number, duration and area affected)

## CHANGE OF THE MINING FOOTPRINT THROUGH TIME: A6, A9, G3



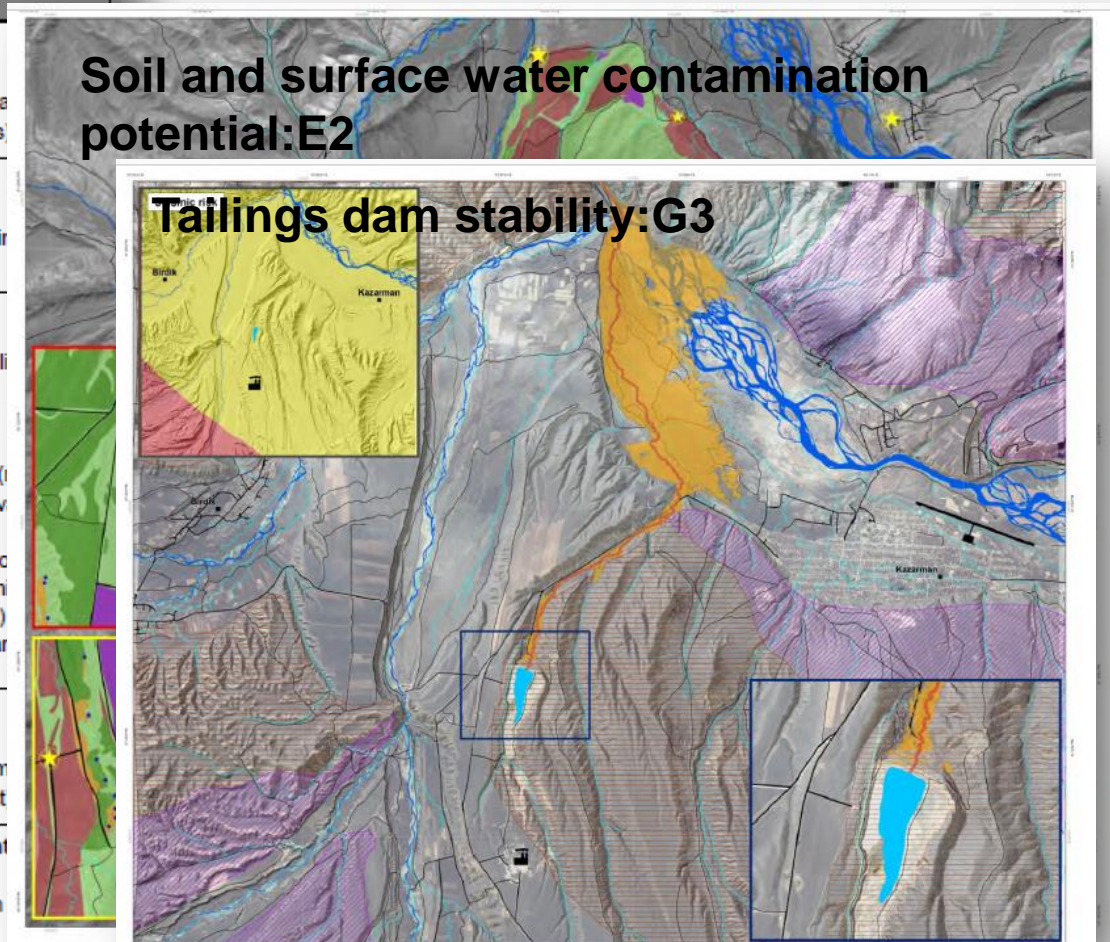




# MAKMAL: Indicators and products



Causes	Environmental issues	Indicators
AMD	Water quality & soil properties	<b>Water Quality</b> E4: Acid drainage generation potential (distribution of sulphidic iron minerals)
Windblown coal dust, gaseous emissions	Atmospheric pollution	<b>Air quality and other nuisances</b> D1: Aerosols (particle concentration in air)
AMD and Mining	Land degradation / loss	<b>Land Use</b> A1: Total land-use by mining and mill (topographic footprint) A4: Residential land-use (residential developments around mining areas) A6: Sites set aside, protected areas (reserves, wetlands, sites of spiritual v similar) A8: Recultivation success on mined- and waste/spoil heaps (designated m areas covered by specific vegetation) A9: Soil fertility of remediated mine ar
AMD sources/buffer material	Water quality & soil properties	<b>Mass Flow</b> B1: Waste volumes generated (volume versus amount of marketable product
Overburden instability	Landslide	<b>Geotechnical hazards and accidents</b> G3: Dam stability (water saturation in dams)
Self-combustion of coal	Coal fires	<b>Geotechnical Hazards and Accidents</b> G4: Underground and mining waste deposit fires (number, duration and area affected)

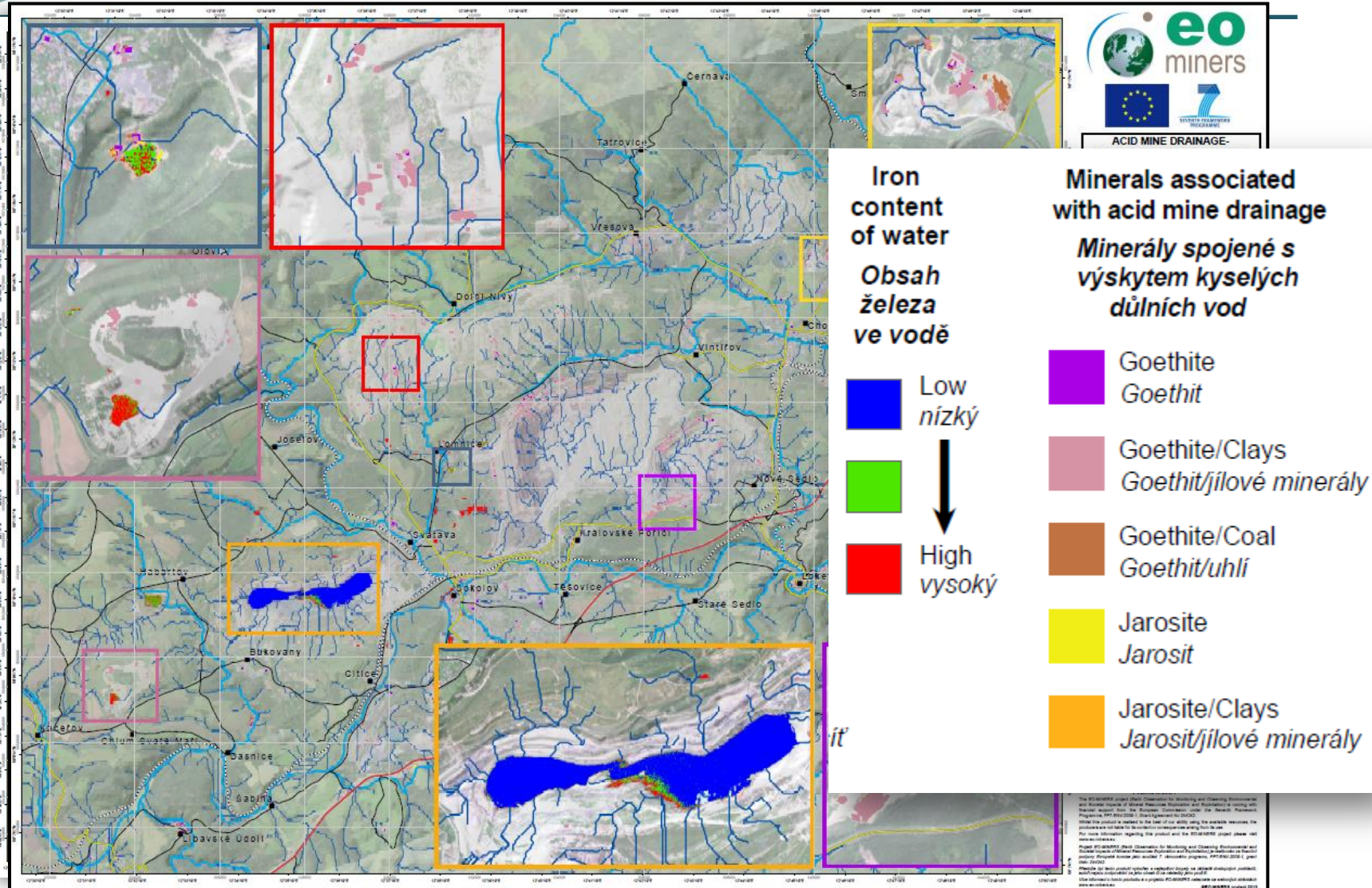


**Project results are provided in a number of form, each designed to explain results to a range of stakeholders**

- Reports
- Digital layers
- Paper maps
- Digital maps
- Animated over-flies
- *Each with associated information and validation histories*

**Sokolov (Czech Republic)**  
**Witbank (South Africa)**  
**Makmal (Kyrgystan)**





## EO-MINERS stakeholders dialogue

European activities

Site-specific activities

Minerals & GEO

MFA Workshop

GMES / RMI  
("Best of local...")

One individual workshop per test site

Workshop  
in South  
Africa

Workshop  
in Czech  
Republic

Workshop  
in  
Kyrgyzstan

***European Stakeholder  
Dialogue on Impact Assessment on  
Mineral Exploration and Exploitation  
using Earth Observation***







## EO-MINERS (2010-2013)



### **Direct links to the booklets are available**

[http://www.eo-miners.eu/data\\_public/sokolov\\_booklet.pdf](http://www.eo-miners.eu/data_public/sokolov_booklet.pdf)

[http://www.eo-miners.eu/data\\_public/emalahleni\\_booklet.pdf](http://www.eo-miners.eu/data_public/emalahleni_booklet.pdf)

[http://www.eo-miners.eu/data\\_public/makmal\\_booklet\\_eng.pdf](http://www.eo-miners.eu/data_public/makmal_booklet_eng.pdf)

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**[www.eo-miners.eu](http://www.eo-miners.eu)**