



Council for Geoscience

EOMINERS

4TH SA-EU SUMMIT

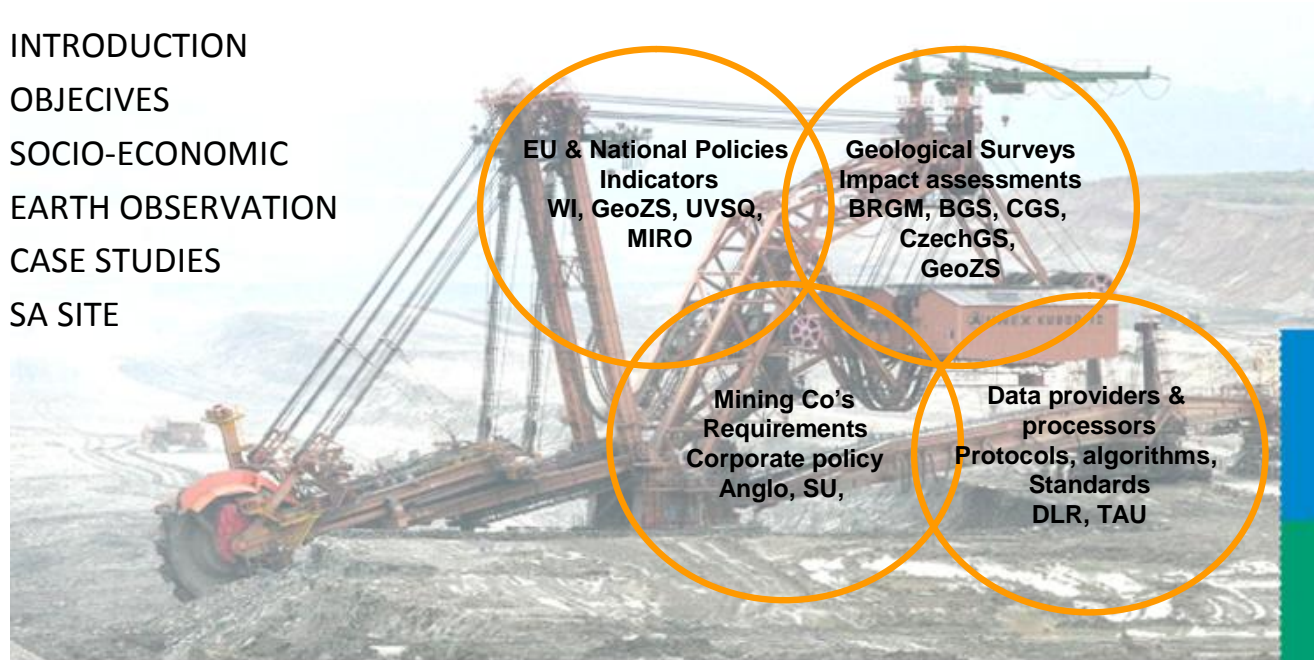
Mineral and Mining Innovation
Partnership

13 September 2011



OUTLINE

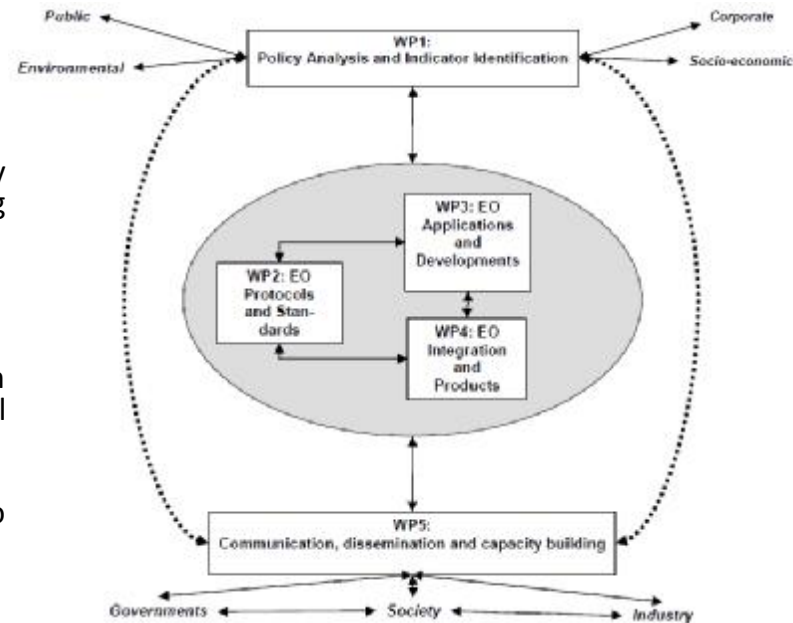
- q INTRODUCTION
- q OBJECIVES
- q SOCIO-ECONOMIC
- q EARTH OBSERVATION
- q CASE STUDIES
- q SA SITE



INTRODUCTION: EOMINERS PROJECT

Objectives

- q introducing innovative remote sensing tools to the mining industry,
- q providing accuracy and quality measures for remote sensing products,
- q demonstrating the application of Earth Observation in different case studies,
- q fostering the dialogue between mining industry and environmental organisations based on EO-derived information and
- q generalising the obtained results to be used in operational mining applications in the future.



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INTRODUCTION: EOMINERS PROJECT

- q WP1: Assess policy requirements at macro (public) and micro (mining companies) levels and define criteria and indicators to be possibly dealt using E:
 - q Environmental criteria and indicators
 - q Socio-economic criteria and indicators
 - q Societal criteria and indicators
 - q Sustainable development criteria and indicators
- q WP3: Use existing EO knowledge and carry out new developments on demonstration sites to:
 - q Demonstrate capabilities of integrated EO-based methods and tools in monitoring, managing and contributing reducing the environmental and societal footprints of the extractive industry during all phases of a mining project, from the exploration to the exploitation and closure stages.
 - q Contribute making available reliable and objective information about affected ecosystems, populations and societies, to serve as a basis for sound “dialogue” between industrialists, governmental organisations and stakeholders.
- q WP2: Summarize and to document the developed models and algorithm, as well as the results of the “dialogue” to establish a baseline for a compendium of best practice approaches that will assist the ongoing and necessary dialogue between society and mining industry.
- q WP5: Capacity building, communication and dissemination

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

WP 1: SOCIO-ECONOMICS

Environmental and societal footprint of mining and the extractive industry

Objective:

- q Identify information requirements derived from policy to inform the selection of appropriate Earth Observation techniques

Through:

- q Assess national and local legislation and policies that regulate the functions of the Government, Civil society and Mining Industry.
- q Use bottom up consultation and research tools (such as a narrative approach) to source information on themes such as affected ecosystems and societal impact due to mining
- q Identify parameters and indicators that can be addressed by Earth Observation methods, and to be used during the EO tools and methods development phase over demonstration sites
- q Identifying stakeholders to be addressed during the dissemination phase at the end of the project

Outcome:

- q Derive specific information demands on the three levels for the development of footprinting indicators for the European Technology Platform on Sustainable Mineral Resources (ETP-SMR)



WP1: Materials and Methods



Consultation Exercise with Agri Mpumalanga

- q Use bottom up research methods (in depth interview) to generate qualitative data in the form of themes;
- q Triangulate the data gathered to generate context specific indicators and a sustainability criteria

Indicators:

Useful tools to reduce a complex set of diverse data into a manageable set for policy decisions and to monitor changes that policy implementation may or may not effect

Dual strategy to develop indicators:

- q **Expert-derived Indicators** - perceived by the experts represented in the EO-Miners project
- q **Social process-derived indicators** are developed in an open deliberation-based processes



WP2: Protocols and Standards for EO Products

- q WP2 aims to develop standardised techniques for EO applications within the scope of EO-MINERS, including
 - q Mission planning, including sensor choice
 - q Data inspection
 - q QC/QA
 - q Calibration and validation
 - q Thematic accuracy and validation
- q Robust, standardised procedures should guarantee reliability and repeatability of methods
- q Standardisation of procedures will also allow inter-site comparisons, moving away from the current often *ad-hoc* approach to EO applications in environmental management



WP 3: EARTH OBSERVATION

- q Study sites
 - q SA, Czech Republic, Kyrgystan
- q Conceptual model
 - q Source
 - q Pathway
 - q Receptor
- q Field investigations
- q Remote sensing techniques
- q Indicators – EO techniques

Satellite data

- Conventional optical sensors, such as Landsat Thematic Mapper, ASTER, Hyperion
- Very high resolution optical sensors, such as Ikonos, Quickbird, SPOT 5
- Radar sensors, in particular for INSAR applications

Airborne data

- Airborne imaging spectroscopy (hyper-spectral) survey
- Airborne geophysics: radiometric, electromagnetic, aeromagnetic

In situ monitoring methods

- Time-lapse electrical resistivity tomography (ALERT)
- Ground monitoring networks
- In-situ point measurements
- Field spectroradiometry campaigns
- Information and/or measurements about vegetation, soil, groundwater and dust
- Chemical Model and 3D Characterization of the contaminated soils

WP 3: CZECH REPUBLIC - SOKOLOV

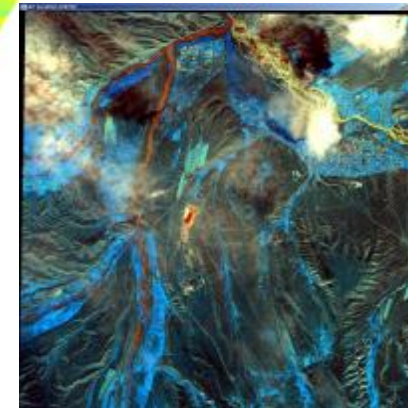
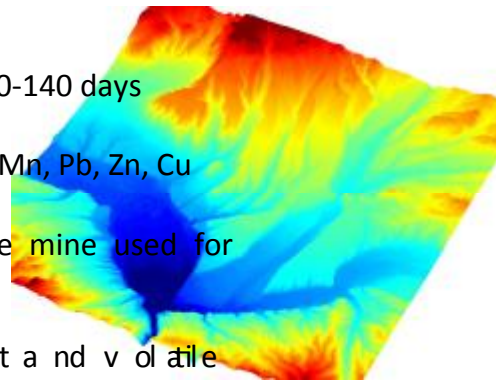
- q Sokolov Basin study area occupies the western part of the Eger Rift - volcanic field Karlovy Vary Thermal Springs
- q Coal mining area
 - q Surface & underground
 - q Rehabilitation in process
- q Two active (Jiř, a nd D r ůžba) a nd abandoned open pit
- q Hyperspectral flight survey
 - q 2010 HyMap
 - q 2011 CASI
- q Thermal flight survey -2011 AIS
- q Dust sampling
 - q Street sediment & dust traps
- q Measurements to characterize surface materials:
 - q ASD
 - q Soil temperature, moisture
 - q XRF
 - q TIR domain, temperature and emissivity



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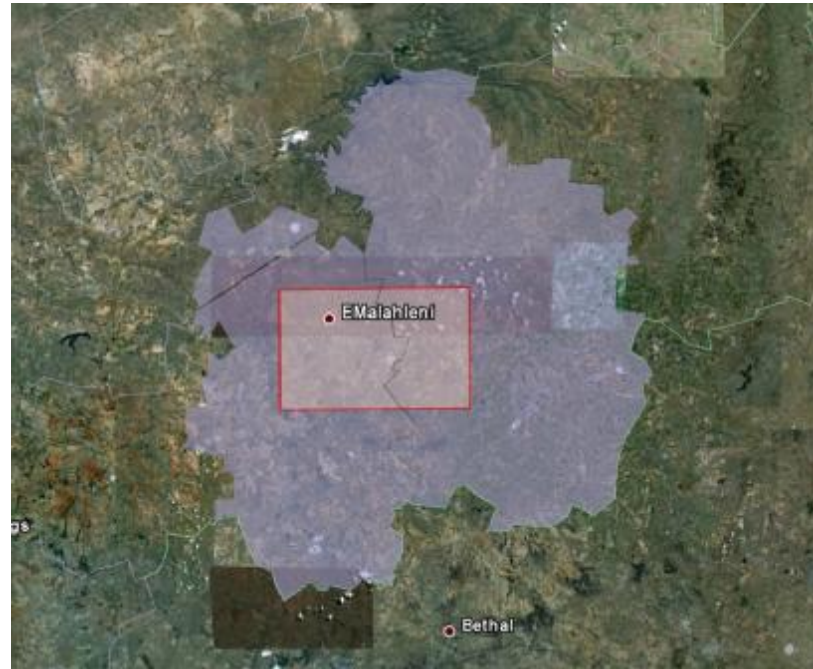
WP 3: KYRGYZSTAN - Karzaman

- q Makmal deposit 2350-2800 m above sea level
- q Former Soviet Union's largest gold mine
- q Gold-copper sulphide mineralization- abundant pyrite; chalcopyrite, pyrrhotite, sphalerite, galena, molybdenite, bismuth minerals
- q Run by Kyrgyz Altyn Company - wholly owned by the Kyrgyz Government
- q Gold-extraction -cyanide leaching method
- q Extreme conditions
 - q Summer season - 70 days
 - q Permanent snow cover 130-140 days
- q Pollution
 - tailing pond with cyanide, Mn, Pb, Zn, Cu
 - High levels in rivers
 - water downstream of the mine used for irrigation
- q Pathways:
 - q Inhalation; airborne dust and volatile compounds,
 - q Ingestion; surface water, groundwater, soil/sediment, and food,
 - q Dermal absorption; direct contact with soil, surface water and groundwater



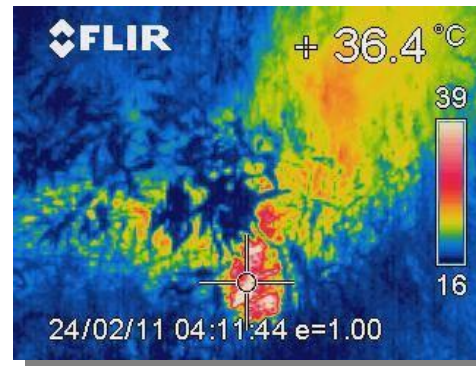
WP 3: SA - MPUMALANGA

- q Witbank coalfield
- q Abandoned mines around Emalahleni
 - q Coal fires
 - q Subsidence
 - q Unrehabilitated dumps
 - q Acid mine drainage
 - q Flooded mine void
 - q Dust



WP 3: SA - MPUMALANGA

- q Coal fire impacts
 - q Residential areas
 - q Air quality
 - q Subsidence
 - q Unrehabilitated dumps
 - q Illegal mining – safety
 - q TIR survey
 - q Map high heat areas
 - q Map mine seepage
- q Subsidence impacts
 - q Health & Safety
 - q Infrastructure
 - q Land use and degradation
 - q Satellite-borne synthetic aperture radar (SAR)
 - q map surface subsidence features related to mining
 - q RADARSAT-2 monitoring



WP 3: SA - MPUMALANGA

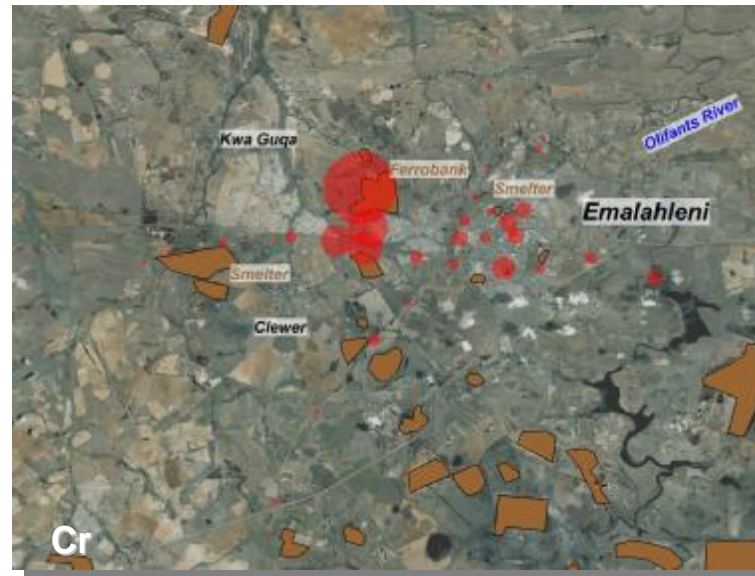
- q Acid mine drainage
 - q Flooded mine void
 - q Environmental impact
 - q Human health impact
 - q Infrastructure impact
 - q Point vs diffuse discharges
- q Monitor quality & impacts
- q Capture and treatment



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WP 3: SA - MPUMALANGA

- q Unrehabilitated mine dumps
 - q AMD source
 - q Dust source
- q Air pollution
 - q Mining impact
 - q Dust
 - q GHG
 - q Associated industries
 - q Power stations
 - q Smelters
- q Dust sampling
 - q Dust traps & wipes indoors
 - q Street sediment



WP 3: SA – MPUMALANGA- ALERT

- q Automated time-lapse Electrical Resistivity Tomography
- q Developed by the British Geological Survey
- q Real-time monitoring of the electrical conductivity of the subsurface environment
- q First installation outside of Europe and the first application of this technology in a mining environment
- q Supported by Anglo Coal - rehabilitating study site
- q Assessment of the impact of rehabilitation activities on the local groundwater
- q Permanent *in-situ* sensors and a “smart” network
- q Will allow the collection of data from multiple sensors “on demand”
- q Volumetric imaging of subsurface hydrogeological processes in real-time at a range of scales and depths
- q Creation of 4 D time-lapse data sets



WP5: Dissemination and/or exploitation of project results

- The results of the work need to be made known to related and also other interested parties
- Use of a wide variety of dissemination media to inform and actively involve governmental organisations, industry and societal groups during the project as well as in its aftermath
- Target audience will be the industry and their trade organisations and governmental organisations
- Social stakeholders groups addressed by other means due to the more technical content of the presentations
- Towards the end of project, the results of the project and its achievements and consequences will be collated and presented in a book





THANK YOU



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