

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 intiatives toward GEOSS

GEO-CRADLE pre-Kick-Off Meeting Friday, 18th of February, 2016

Eyal Ben Dor Tel Aviv University

Highlights of EO-MINERS FP7 Projects



{Logo of Institute}

IONIC Centre, 11 Lysiou Street Athens, Greece





EO-MINERS

European Technology Platform on Sustainable Mineral Resources







Earth Observation for Monitoring and Observing Environmental and Societal Impacts of Mineral Resources Exploration and Exploitation

Stéphane CHEVREL Project Coordinator BRGM, France – Mineral Resources Div.





Wuppertal Institute for Climate, Environment and Energy



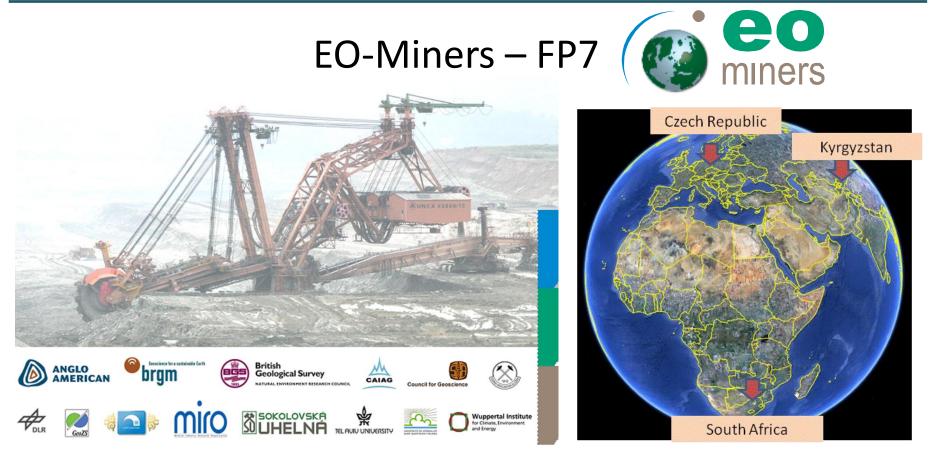












"Integrate new and existing Earth Observation tools to improve best practice in mining activities and to reduce the mining related environmental and social footprint"









The objective of this activity is to organise the EO-MINERS products so that they can form part of the Global Earth Observing System of Systems (GEOSS) being developed by the Group on Earth Observations (GEO). This will ensure that the project's outcomes form a contribution to GEO from the minerals sector, filling a strategic gap in GEO, an initiative which does not address minerals to any meaningful extent at present.



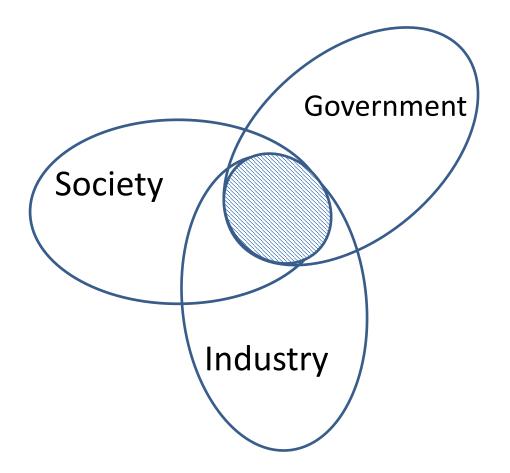


- WP1: Policy Analysis and Indicator Identification
- WP2: Protocols and standards for EO products
- WP3: EO application and development over demonstration sites
- WP4 : EO integration and products
- WP5 : Communication, dissemination, capacity building and exploitation





The EO-Miners Trialog Concept







EO Data in EO-MINERS

Sokolov

- HyMap 2009 / 2010
- CartoSat 2009, 2010, 2011
- > AHS 2011 (+ AISA, partly processable)
- ASD / μFTIR measurements, XRF measurements, samples for lab analysis, temperature measurements, dust samples

Witbank

- ≻ FLIR 2011
- > WV-II 2011 (DEM exisit)
- > ASD measurements, temperature measurements, dust samples
- ALERT system installed at bank no.5

Karzaman

- > WV-II 2011 (DEM and relief and drainage parameter exist)
- > ASD measurements, GPS measurements, dust samples









EO Product Development Matrix

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EO Product Development Matrix

Environmental issues	Indicators	Measurable parameters	Potential for EO assessment of parameters	EO data availability for parameters	Task /status	Comments	Scale	Data Layer	Investigating institute
Water quality & soil properties	Water Quality: E4 Acid drainage generation potential (distribution of sulphidic iron minerals)	Distribution of secondary iron oxide minerals	YES – Hyperspectral airborne data	Airborne hyperspectral available for '09,'10 and '11 (although cloudy); some ASTER imagery may be of limited use	Selected AMD- related minerals can be mapped. CzechGS used ASTER for mineral mapping(?)	Czech GS are finishing pH map based on mineral/coal composition - compare with other results from TAU/DLR?	Local	image/grid or vector layer of iron oxide minerals	DLR, TAU, BGS, BRGM & Czech GS
		Distribution of minerals with neutralisation capacity	YES – Hyperspectral airborne data	Airborne hyperspectral available for '09,'10 and '11 (although cloudy); some ASTER imagery may be of limited use	Selected minerals/soils can be mapped. CzechGS used ASTER for mineral mapping(?)	Selected soils and minerals can be mapped. Map scale?	Local	image/grid or vector layer of neutralisin g minerals	DLR, TAU, BGS, BRGM & Czech GS
		Surface drainage map	YES – SRTM, LiDAR DEM from stereo aerial photography or satellite imagery. Note: digital terrain model is required	5 m DEMs derived from Cartosat stereo images of 2009, 2010 and 2011 (not currently suitable). There is also a photogrammetric 5m DEM from approx 2008 with a 3 year age range	DEMs exist but they need to be edited. BRGM to discuss potential improvements with DLR?	Hydrologically correct DEM and/or dGPS data required; can potentially use photogrammetric DEM. GIS stream network exists => drainage map of mining area risk?	?	surface draining map - Strahler order streams, vector map	BRGM to lead, with support from Czech GS, DLR & BGS
		Relief maps	YES – SRTM, LiDAR orDEM derived from stereo aerial photography or satellite imagery	5 m DEMs derived from Cartosat stereo images and some ASTER imagery. We also have 10k and 25k vector topographic map data and VK indicates that the IPR will allow us to use them		Task for Czech GS; Cartosat DEM may be useful once validated. 1:10,000- scale maps on FTP	?	DEM, displayed as shaded relief base map (raster format)	Czech GS & BGS





WP2 deliverables

- D1.8 "Status quo of monitoring environmental indicators by EO services" was submitted
- D2.1 "EO Mission Planning for Environmental Monitoring of Mining Impact
- D2.2 "Data Inspection".
- **D2.3** "Atmospheric calibration and validation"
- **D2.4** "Thematic accuracy and validation
- **D2.5** Documentation and dissemination





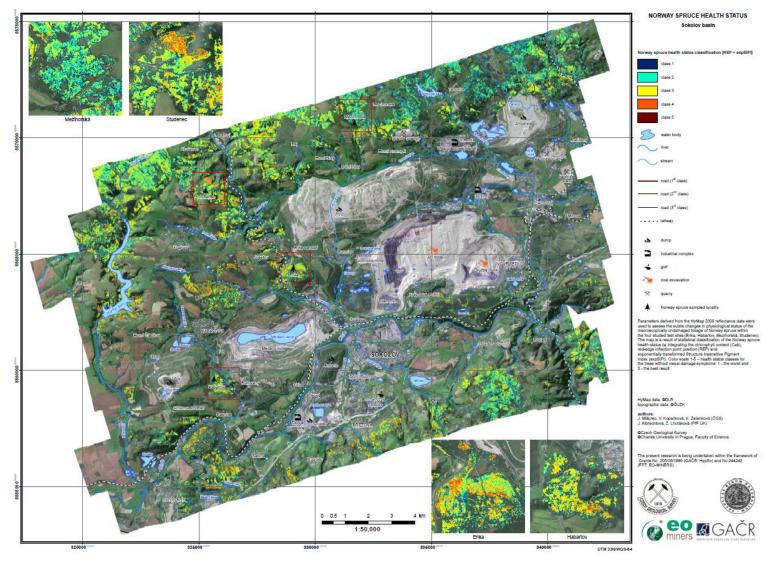
Related GEOSS Strategic Targets

- <u>User Engagement</u>: Increased use of geo-spatial data in all Societal Benefit Areas and in particular in developing countries.
- <u>Health</u>: Access to improved environmental information and tools to support the global community of human health and environment experts. Applying outcomes from other Societal Benefit Areas to improve health and well-being.
- <u>Energy</u>: Significant increase in use of Earth observations by all sectors (biomass, fossils, geothermal, hydropower, nuclear, ocean, solar and wind) for improved environmental, economic and societal impact assessments of energy exploration, extraction, conversion, transportation and consumption.
- <u>Water</u>: Increased availability of data and information, including quantity and quality of both surface and groundwater, to support a water cycle decision making system.
- <u>Ecosystems</u>: Increased operational monitoring of major ecosystems on land on an annual basis. Increased operational monitoring of major marine and coastal ecosystems on an annual basis.





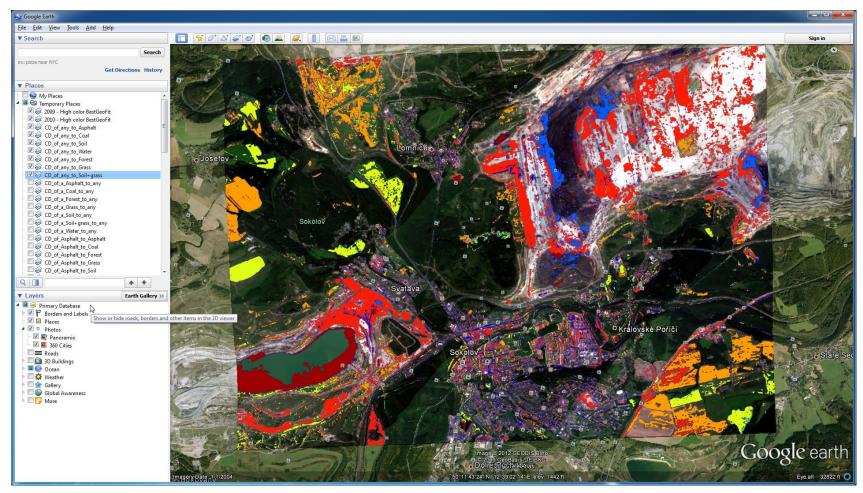
EO Product Sample (map)







Change Detection – Using SOT method for extracted significant spectral change Sokolov 2009-2010



(Google Earth as an easy interface for thematic map presentation)





Main achievements of WP2 in EO-Miners (standards and protocols)

- ASD spectrometer operation and documentation (TAU)
- Field spectra processing workflow
- Geo-rectifying work flow and inspection (TAU)
- Radiometric inspection and atmospheric correction (TAU, DLR)
- Sampling of vegetation using SPAD Chlorophyll meter
- Estimating the Noise Level in the radiance domain
- Standards and Protocols for Reflectance Measurement of Soils in the Laboratory

- Dust wipe sampling
- Dust site selection
- Street dust sampling procedure
- Street dust chemical analytical procedure
- Field database documentation in excel (BRGM)
- ALERT system installation
- Field work documentation protocol
- Emissivity measurement protocol





EO-Miners WP-2

- WP2 is focused on standards and protocols for EO projects.
- A large number of EO working protocols were collected and developed during the project period.
- The output of WP2 is 5 deliverables that can be used in future projects as standard working protocols





Main achievements of WP2 in EO-Miners

(General)

- Mapping indicators to EO tools
- Mission planning protocol
- Geo-rectification protocol
- Geo-rectification quality indicators
- Field spectral measurements protocol
- HRS atmospheric correction protocol
- HRS atmospheric correction quality indicators
- HRS atmospheric correction comparison
- New HRS change detection approach (two articles in review)
- Thermal atmospheric correction protocol
- Emissivity field measurement protocol
- Thermal clay/ sand mapping
- Apparent thermal inertia mapping
- WV-2 iron oxides mineral mapping
- New digital field archiving tool (CSIRO has requested a copy)
- Spectral prediction of dust components
- Reflectance measurement of soils in the laboratory protocol





USAID NIFA

EUFAR -1 EUFAR-2 EO-MINERS



