EO-MINERS: Earth Observation for Monitoring and Observing Environmental and Societal Impacts of Mineral Resources Exploration and Exploitation

The social acceptability of a mining project, from exploration to closure, is among the major key issues to be dealt with. EO-MINERS scientific and technical objectives are to: i) assess policy requirements at macro (public) and micro (mining companies) levels and define environmental, socio-economic, societal and sustainable development criteria and indicators to be possibly dealt using Earth Observation (EO); ii) use existing EO knowledge and carry out new developments on demonstration sites to demonstrate the 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 and iii) contribute making available reliable and objective information about affected ecosystems, populations and societies, to serve as a basis for a sound "dialogue" between industrialists, governmental organisations and stakeholders.

Approach and Methodology

The need to assess policy requirements and define criteria and indicators to be possibly dealt using EO methods and tools will first be addressed through an analysis of policies related to the environmental and social footprint of mineral industries. EO-MINERS then will contribute to develop high level EO-based data products applicable to the different stages of mining activities within the life cycle of mining operations, over three demonstration sites (Czech Republic, South Africa and Chile). From these developments, it is subsequently intended to contribute to the development of generic EO data integration schemes, in particular in view of characterising affected ecosystems, populations and societies and prepare indispensible documents for industrialists, governmental organisations and stakeholders. To this end, the project will continuously take care of robust and reliable standards and protocols that guarantee the repeatability of the methods deployed.

EO TOOLS and METHODS

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

**Airborne data**
- Airborne imaging spectroscopy (hyperspectral) 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

Expected Results

The core of the project aims at developing EO-based tools for helping monitoring the impact of mining activities on the environment and on the society of the exploration and exploitation of mineral resources. It also adresses GEO (Group on Earth Observation) and GEOSS (Global Earth Observation System of Systems) process and tasks, by using these tools to define core elements of an environmental observing system and examining how this system fits in GEO and contributes to building GEOSS. Means for a sound "dialogue" (definition: "an interchange and discussion of ideas among three groups having different origins, philosophies, principles, etc., between three or more groups involved, the industry, governmental organisations and other stakeholders (e.g. NGOs) are expected.

Test sites

- Sokolov Igneite mine, Czech Republic
- Emalahleni coal mine, South Africa

EO-MINERS and GEO

**Objectives**
- Filling a strategic gap in GEO, an initiative which does not address minerals to any meaningful extent at present, based on:
  - Mining and Environmental EO Systems developed in EO-MINERS
  - Identification of synergies and gaps between EO-MINERS and GEO

**Strategy**
- Review the existing GEO Tasks covering the 9 societal benefit and 5 transverse areas defined by GEO work plan 2007-2009.
- Maintain a dialogue with GEO, visiting GEO members and participating organisations in ACP countries and Europe as necessary.
- Participate in GEOSS conferences and workshops, making presentations on the contribution of mining and environmental observations to specific societal benefit and transverse areas.
- Run a minerals workshop with GEO members and/or the GEO Secretariat

**Deliverables**
- "EO-MINERS to GEOSS Mapping Deliverable and Report" including:
  - a proposal for the update of the GEO Work Plan
  - proposals for follow-on projects to deliver against common EO-MINERS and GEO targets
  - proceedings of EO-MINERS presentations at GEO Workshops and Conferences.

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