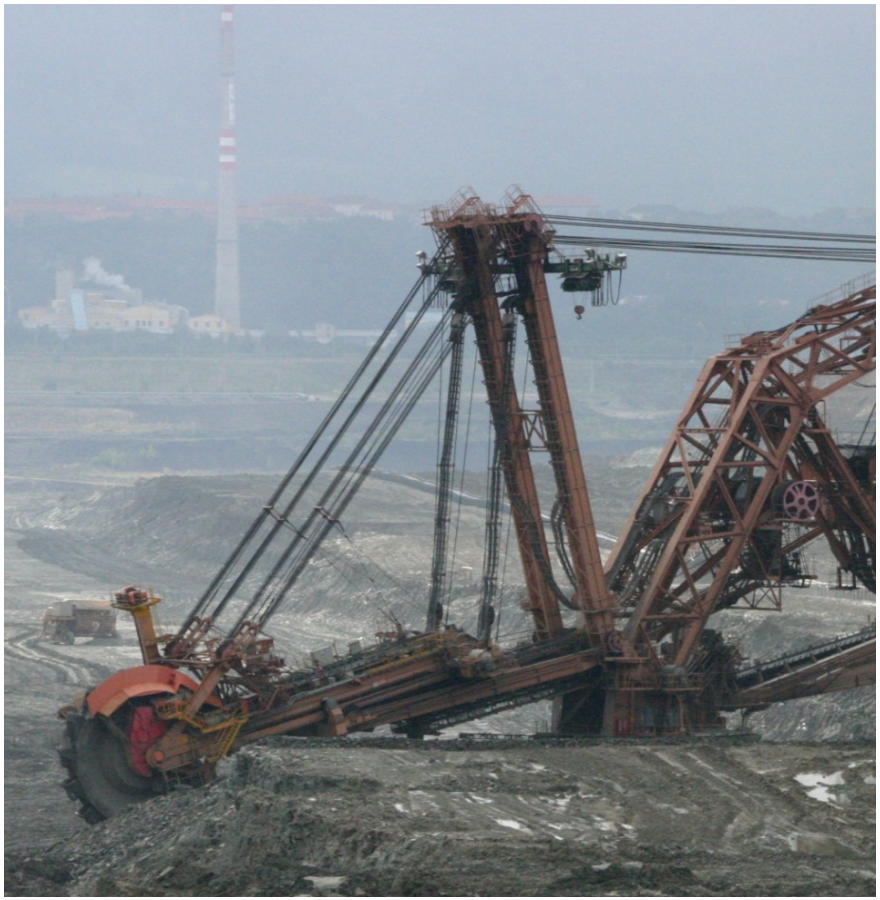

Earth Observation for Monitoring and Observing Environmental and Societal Impacts of Mineral Resources Exploration and Exploitation

The EU Project EO-MINERS

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Policy Assessment and Indicator Development

Scientific and Technical Conference EO-MINERS
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Policy Analysis

Stocktaking of policies and stakeholders in three areas:

- Corporate Policies in a Mineral Extraction Context (D1.1-1)
  - mine level
- Civil Society Policies in a Mineral Extraction Context (D1.1-2)
  - mine level to national level
- Public Policy Analysis (D1.2)
  - national, EU and international information requirements

Corporate Policies in a Mineral Extraction Context

Patterns of corporate social responsibility

- … vary between different regions culturally (e.g. patriarchical forms of CSR)
- … change over time
- Indications that the relationship between mining company and other stakeholders is determined by the size of the company or corporation: locally rooted companies rather less confrontational

Increasing number of obligations for mining operators

- New regulations from authorities, also in response to pressure by external stakeholders
- New stakeholders, or traditional stakeholders with new areas of interest, cause existing corporate policies to adapt or the development of new fields of corporate policies

Mining companies increasingly act more pro-actively,

e.g. by social contracts, to minimise risks/business risks, that my arise from protests and legal actions

Civil Society Policies in a Mineral Extraction Context

Diversity: Compositions of civil society stakeholders and their interest in and attitude on mining is very diverse

Variety of stakeholder relationships, ranging from confrontational to collaborative

- some, typically international, NGO take their justification from a confrontational course in principle

Views and agendas of stakeholders are shaped by

- company policies,
- the performance of the mining operation with respect to controversial issues,
- by specific events (incidents)

Variety of “civil society landscape” and stakeholder relationships

- Obvious difference between civil society organisations in CZ and SA
- In CZ the agendas are dominated by (grass roots) environmental issues, in SA by social and societal issues

Public Policy Analysis

Public Policy Analysis: Comprehensive review of policies, grouped by the following policy arenas

Aim: Investigating information requirements based on (published) policies of International, EU, CZ, SA, KG policy frameworks

- Sustainable Development
- Resource Policies and Initiatives
- General Environmental Policies
- Specific Environmental Policies
  - Conservation of Biodiversity and Cultural and Natural Heritage
  - Air Pollution
  - Water Pollution
  - Management of Waste and Hazardous Substances

These different arenas have their own historical development and stakeholders on different political levels, corresponding to specific information requirements

Why indicators for mining impact?

Impacts of mining operations are of complex nature

- Difficulties to assess the effects of decisions made by the different actors
- Complications at monitoring and assessing due to the absence of reliable and objective site data

Indicators

- can be used to understood meaningful information on complex issues more easily
- Display the state of complex systems, or
- allow to follow trends, when observations are repeated over time

Properties of Indicators

Indicators need to have a number of specific qualities and properties

- **Referencing:** indicators require a clearly defined purpose
  - Stakeholders define what has to be indicated for whom and why
  - Indicator development is a social process and not an engineering one
- **Interpretability**: clarity on desirable direction
- **Measurability**: indicators need to be based on measurable quantities to be operational
- **Clarity**: indicator selection inevitably results in a gain in clarity, but also means a loss of information

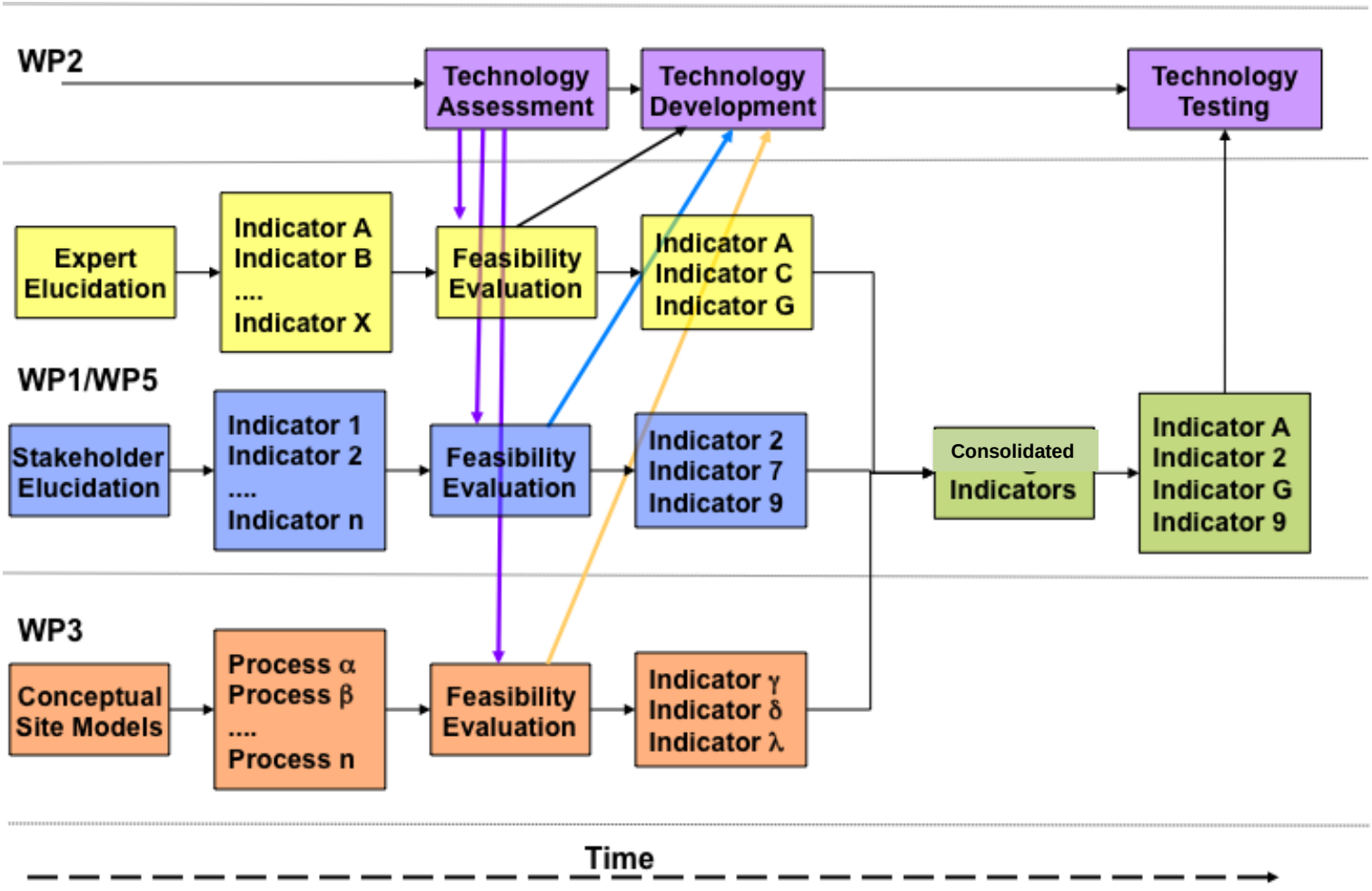
Indicator Development Process

A *multi-pronged approach* was chosen in EO-MINERS

- development of an initial set of indicators by technical experts
- development of *site-specific conceptual models* (D3.1)
- Interview campaigns were conducted with stakeholders at the study sites

These three processes ran in parallel and through several loops of iterations at the study sites

Indicator Development Process



EO-Miners Indicator Development Process

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- The proposed (merged) set of indicators was reviewed by Earth Observation specialists in order to assess their measurability.

→ Set of candidate indicators, consolidated successively throughout the loops

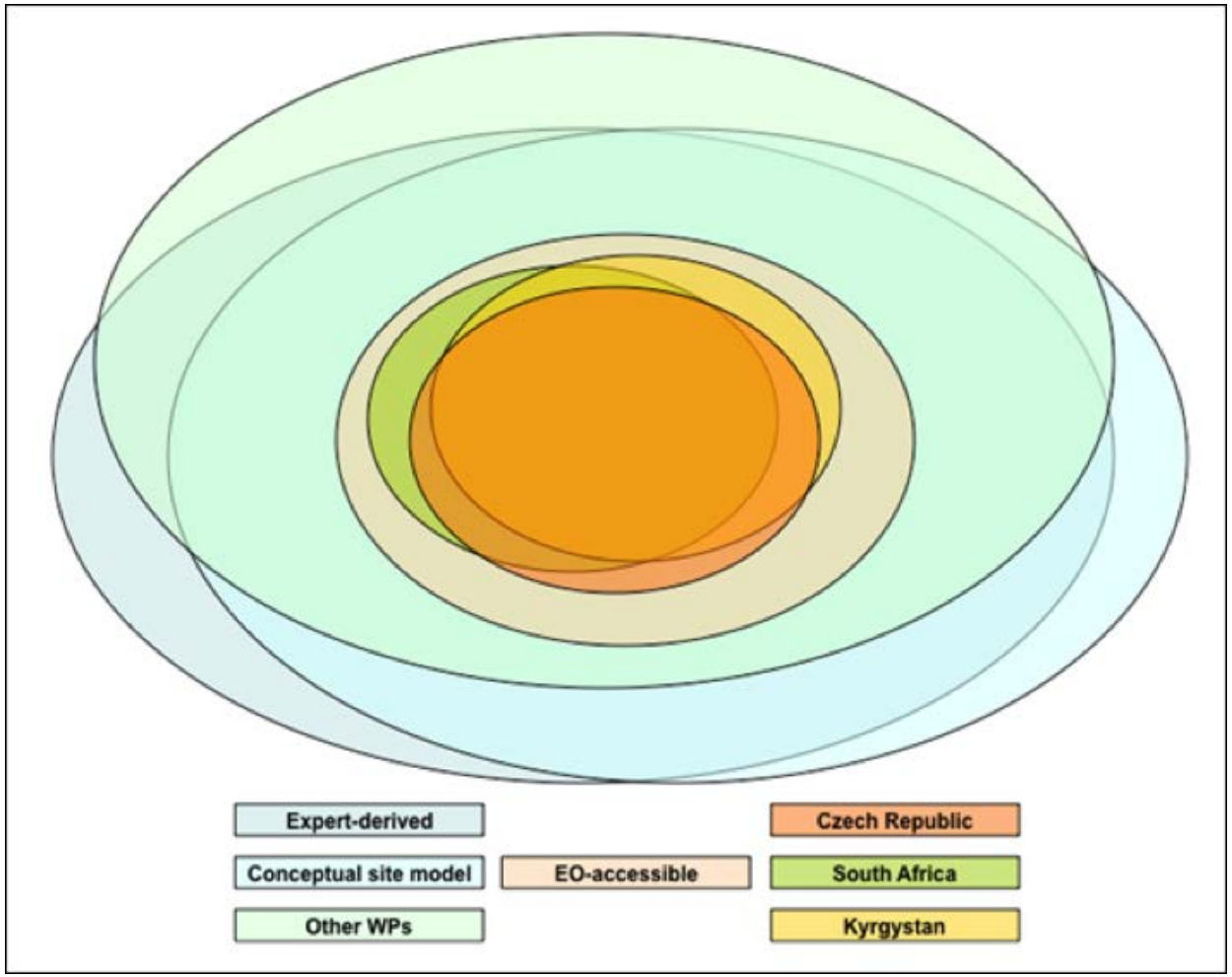
→ Subset specified for each of the study sites

EO-Miners candidate indicators

A. Land-use
B. Mass and energy flows
C. Air-quality and other nuisances
D. Soil quality
E. Water quality
F. Transport
G. Geotechnical hazards and accidents
H. Industrial and other accidents
I. Social impact
J. Regional development
K. Economic vulnerability/resilience

Site-specific candidate indicators

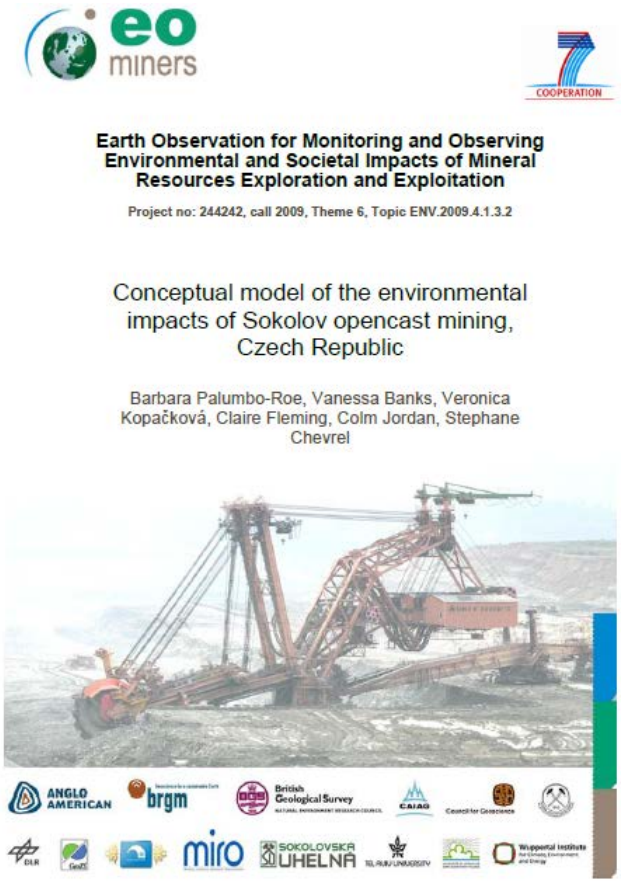
- Only indicators that can be measured using EO techniques have been retained for further work at the study sites
- The set of indicators varies from study site to study site



Sokolov-specific indicator development

- Initial set of indicators by technical experts (general list)
- Conceptual site model:
  Palumbo-Roe et al. (2011), D3.1
- Interview campaigns were conducted with stakeholders at the study sites
  - semi-structured interviews conducted in 2010

  → high importance to gain a **balanced and representative group of stakeholders** (interpretability of D1.4 results)
  - Interview minutes based on notes taken during interviews (D1.5A)
  - concerns and information needs expressed were related to the set of candidate indicators → intersection sub-set.



Sokolov-specific indicators

Causes	Environmental issues	Indicators
Acid mine drainage (AMD)	Water quality & soil properties	**E. Water quality** E4: Acid drainage generation potential
Windblown coal dust, gaseous emissions	Atmospheric pollution	**D. Air qualitiy** D1: Aerosols (particle concentrations in off-site air
Mine operation	Land degradation/loss	**A. Land-use** A1: Total land-use by mining A4: Residentail land-use A6: Sites set aside, protected areas A8: Recultivation success on mined-out areas etc. A9: Soil fertility of remediated areas
AMD sources/buffer material	Water quality & soil properties	**B. Mass Flow** B1: Waste volumes generated
Overburden instability	Landslide	**B. Geotechnical hazards and accidents** G3: Dam stability
Self-combustion of coal	Coal fires	**G. Geotechnical Hazards and Accidents** G4: Underground and mining waste deposit fire

Thank you
for your attention!

International Policy Framework

- **Sustainable Development**
- **Resource Policies and Initiatives**
  - Berlin Guidelines (1991)
  - Extractive Industries Review (2001)
  - Global Dialogue on Mining/Metals and Sustainable Development
  - Extractive Industries Transparency Initiative (2002)
- **General Environmental Policies**
  - Aarhus Convention on Access to Information, Public Participation in decision-making and access to justice in Environmental matters (1998)
    - Kiev Protocol on Pollutant Release and Transfer Register (2003)
- **Specific Environmental Policies**
  - Conservation of Biodiversity and Cultural and Natural Heritage
  - Air Pollution
  - Water Pollution
  - Management of Waste and Hazardous Substances

EU Policy Framework

- **Sustainable Development**
- **Resource Policies and Initiatives**
  - Thematic Strategy on the Sustainable Use of Natural Resources (2005)
  - The Raw Materials Initiative (2008)
- **General Environmental Policies**
  - Directive 2008/1/EC concerning Integrated Pollution, Prevention and Control (IPPC)
  - Directive 85/337/EEC on the Assessment of the Effects of Certain Public and Private Projects on the Environment
  - Regulation 166/2006 concerning the Establishment of a European Pollutant Release and Transfer Register (E-PRTR)
- **Specific Environmental Policies**
  - Biodiversity
  - Air
  - Water
  - Soil
  - Waste and Hazardous Substances