

Impact Monitoring of Mineral Resources Exploitation – FP7

MIGEM Delegation

Graphisoft Park - Geonardo, 11.10.2012.



ImpactMin Admin (C. No. 244166)

Impact Monitoring of Mineral Resources Exploitation

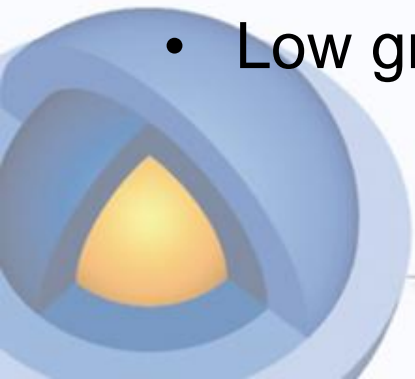
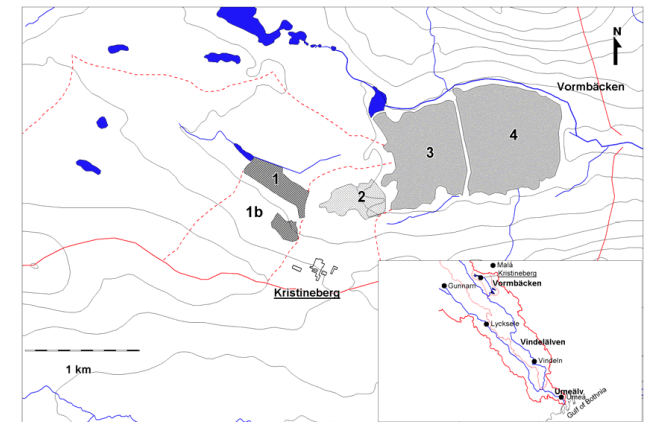
- Budget: 3,3 M EUR
- Duration: 36 Months
- Start date: 01/01/2010
- 11 Partner
- Coordinator: Geonardo Ltd.
- 4 Pilot Site (Sweden, Bosnia and Herzegovina, Russia, Romania)



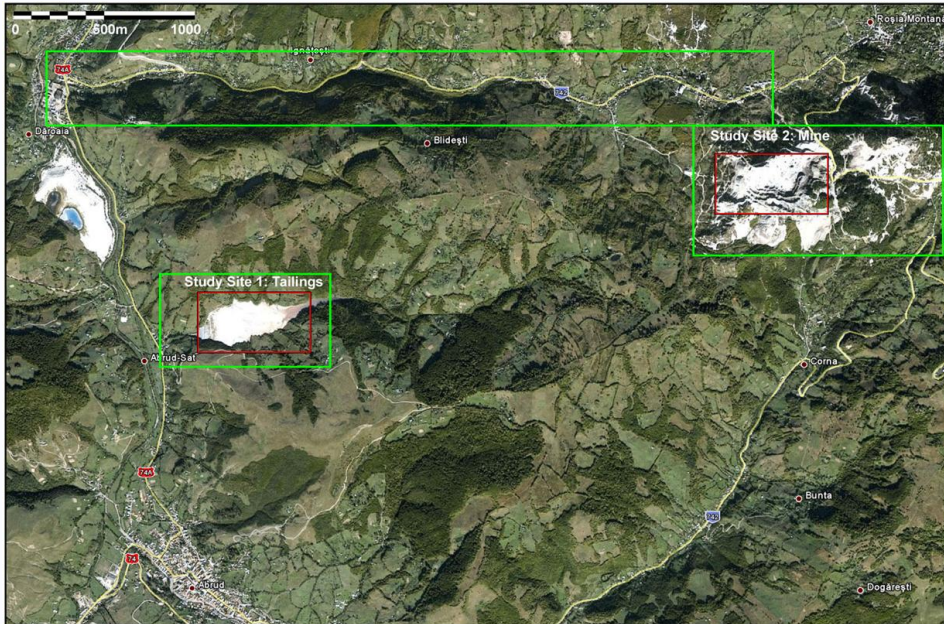
ImpactMin Demo Sites - Kristineberg



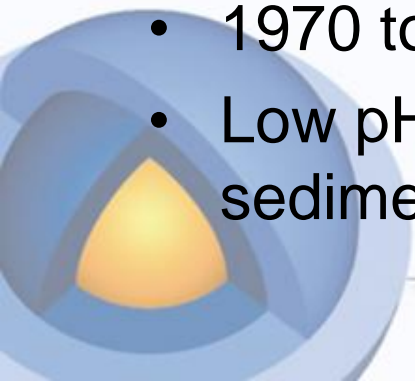
- Boreal sub-zone
- Comprises large tailings
- Three open pits
- Low grade pyrite and pyrrhotite



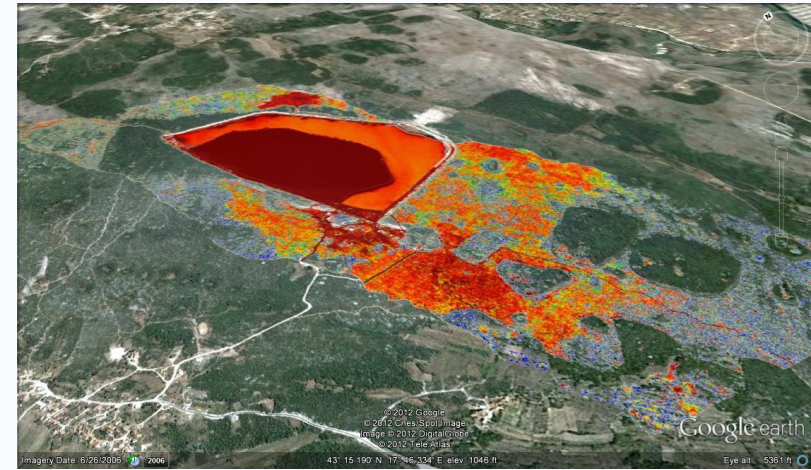
ImpactMin Demo Sites – Rosia Montana



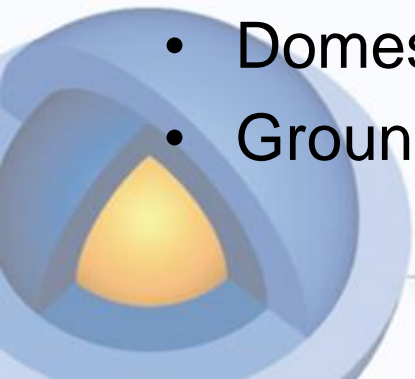
- Gold and base metals
- 1970 to 2006 development of the open pit
- Low pH and high contents of heavy metals (waters & sediments)



ImpactMin Demo Sites - Mostar



- 500m distance from Center:
- Coal Mine ~ 1900s – 1990 (U.G &O.P)
- Coal-Fires, Geomechanical Failure
- Domestic & Other Waste (radioactive?)
- Ground Water Pollution (Carst)



ImpactMin Partnership



Geonardo Ltd, Hungary

Geosense, the Netherlands



Institute of Mineralogy, Russian Academy of Science, Russia



University of Exeter, Camborne School of Mines, the UK

Babes-Bolyai University, Romania



Lulea University of Technology, Sweden



Ukrainian Land and Resource Management Center, Ukraine



Photon LLC, Croatia

DMT GmbH & Co.KG, Germany



University of Mostar, Bosnia and Herzegovina



Flemish Institute for Technological Research, Belgium



Impacts of mining

Environmental, Economical and Social

- Responsibilities (policy making-RMI,sustainability-EIP)
- Mining industry uses 7-10% of the global energy supply (Earthworks, 2004).
- Finding the „boundaries” (Mining Waste Directive, 2006)

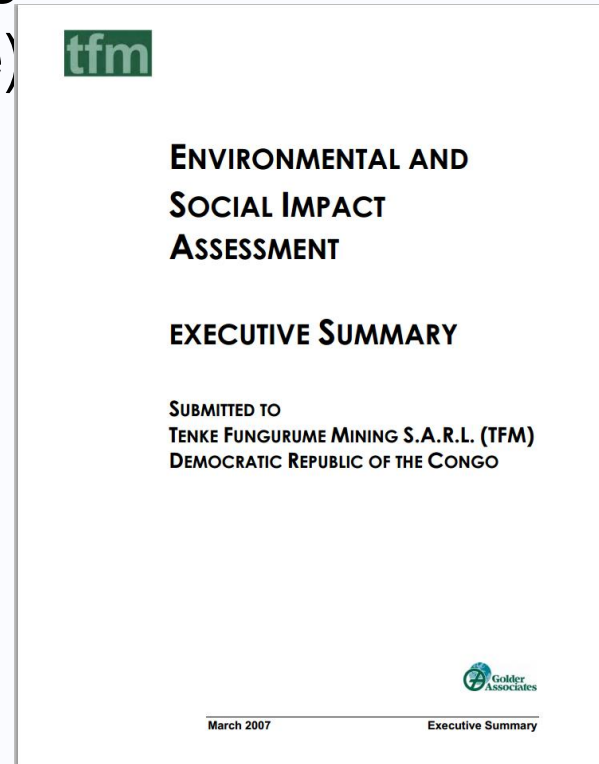
Response of the Industry:

- Corporate Social Responsibility
- Sustainability measures (e.g. Global Reporting Initiative)



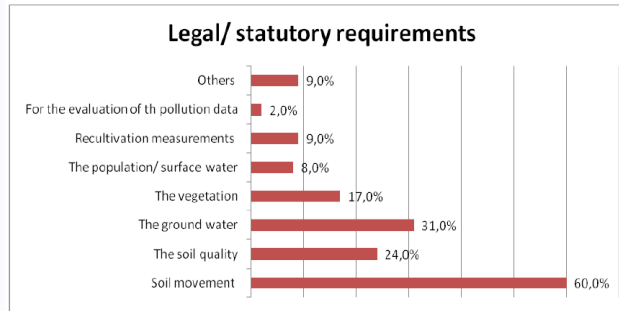
Corporate Social Responsibility („act code“ in the 21. century?)

- ImpactMin demo sites (from exploration to post-mining)
- Social and cultural differences across sites
- Dependent/remote communities (due care)
- Locals are usually „positive“ about mining
- „Image“ need to be shown:
 - Expectation - consultation methods
 - Info flow on ***environmental issues***

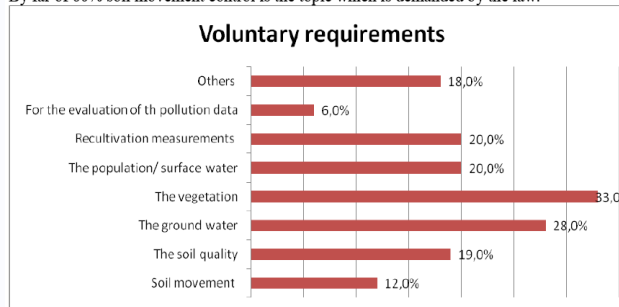


Information on the Environment (needed when reporting)

- Planning of operation, follow up (land use change)
- Biodiversity, Land use (vegetation health and status)
- Mine waste and soil inventory (mineral characterization soil - quality, waste)
- Ground Stability (dams, underground workings, etc.)
- Air disturbance
- Water disturbance



By far of 60% soil movement control is the topic which is demanded by the law.



**DEMAND
VS.
SUPPLY
(Technology)**



Observables (in the Environment)

Information on the Environment	Observed Environmental Media
Biodiversity, Land use	Vegetation, surface objects
Planning of operation, Land use change	Surface objects, vegetation
Status of Air	Air, Plant (leaf) stress
Status of surface waters	Water and sediments
Status of Soils	Soils
Ground movement	Surface (motion)



ImpactMin (identified) Tools

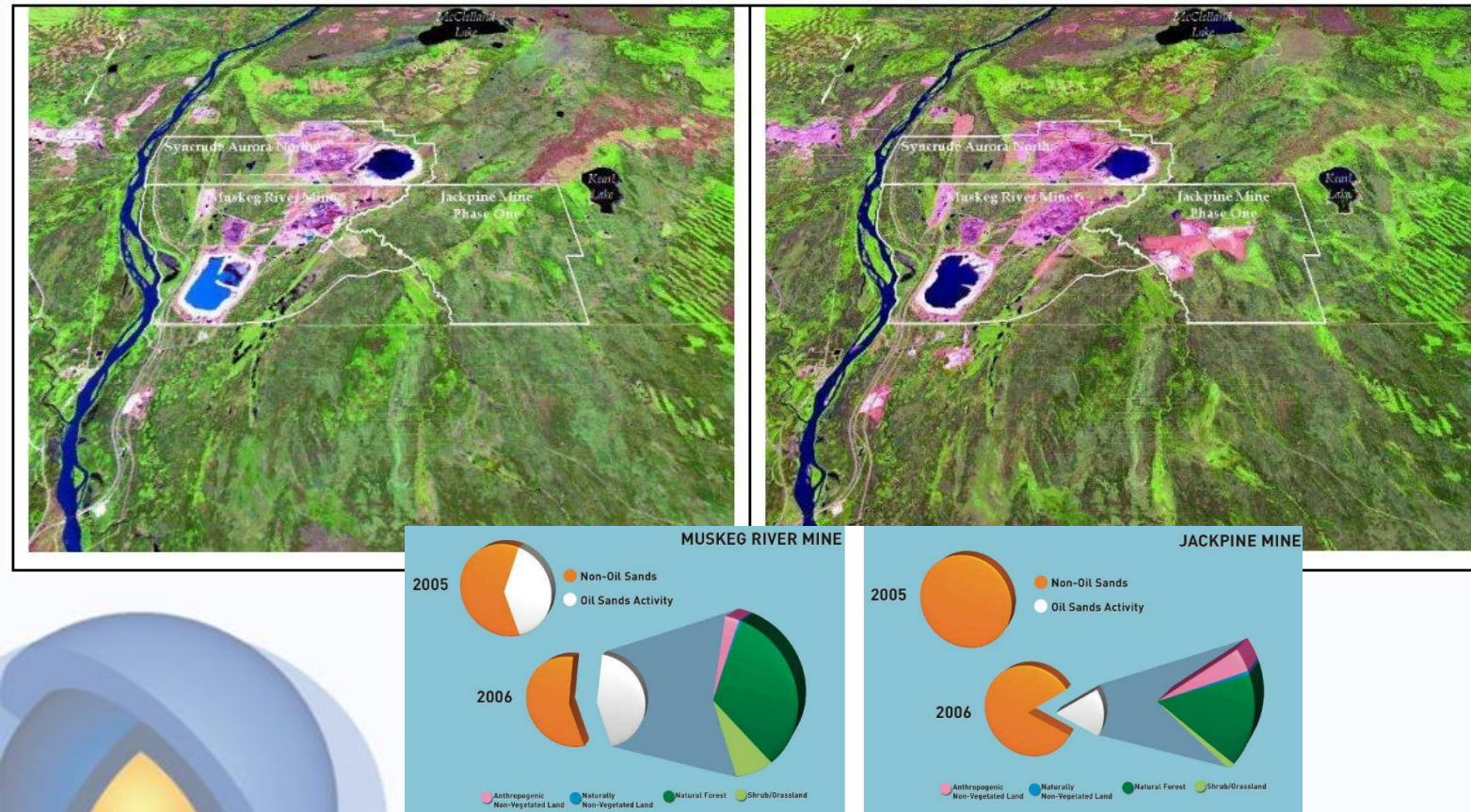


Information on the Environment	Observed Environmental Media	Analysis	Tools
Biodiversity, Land use	Vegetation, surface objects	Spectral	Ground, Remote Sensing (RS)
Planning of operation, Land use change	Surface objects, vegetation	Spectral	Ground, RS
Status of Air	Air, Plant leaf/stress	Mineralogical, spectral	Ground, RS
Status of Waters	Water and sediments	Geochemical	Ground
Status of Soils (Waste)	Soils	Spectral, Geochemical	Ground, RS
Ground movement	Surface	Motion	RADAR Interferometry



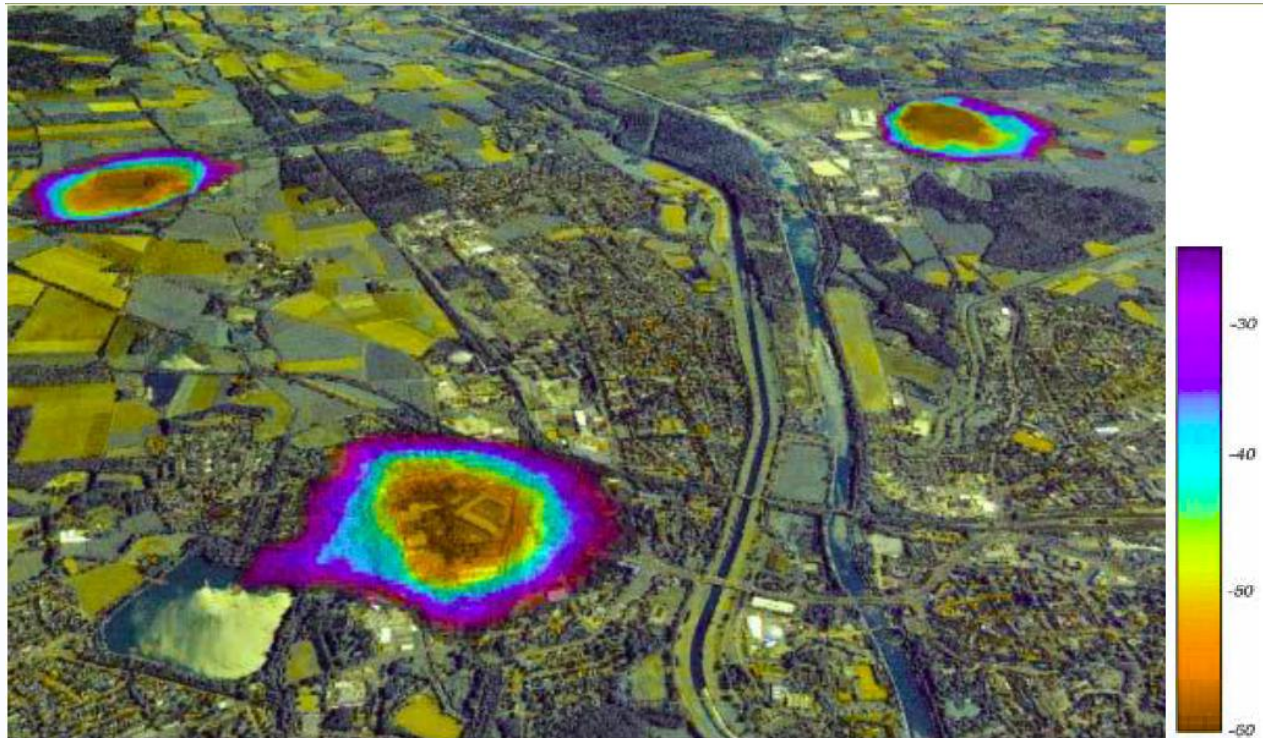
Compendium of methods and tools

Land use change (Time series analysis – Canada)



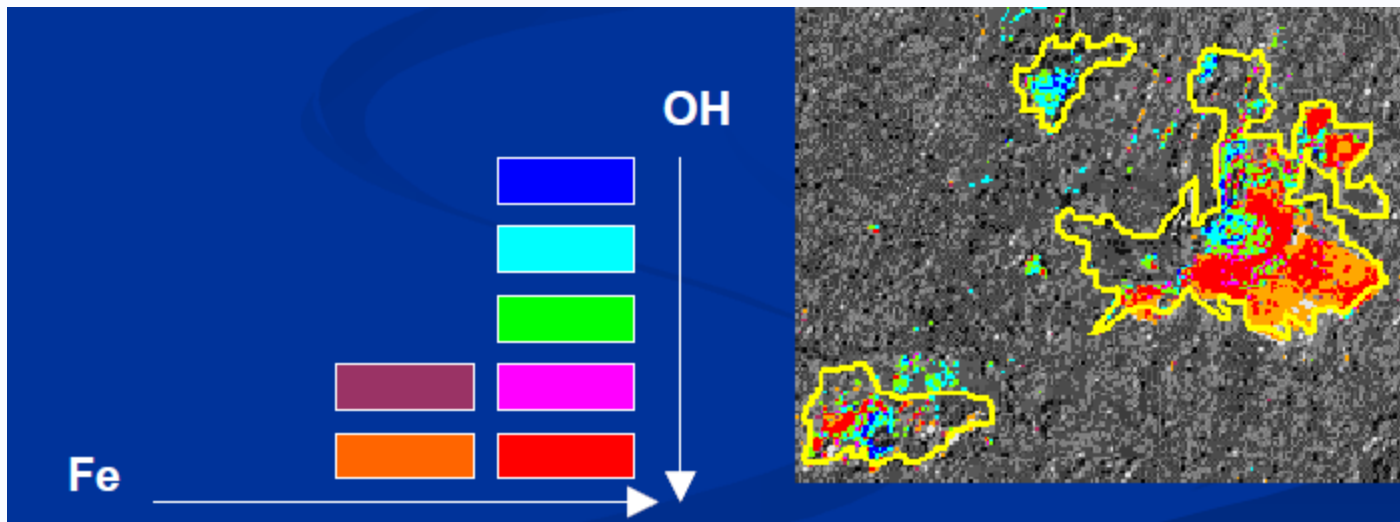
Compendium of methods and tools

Ground movement (RADAR Interferometry – Germany)



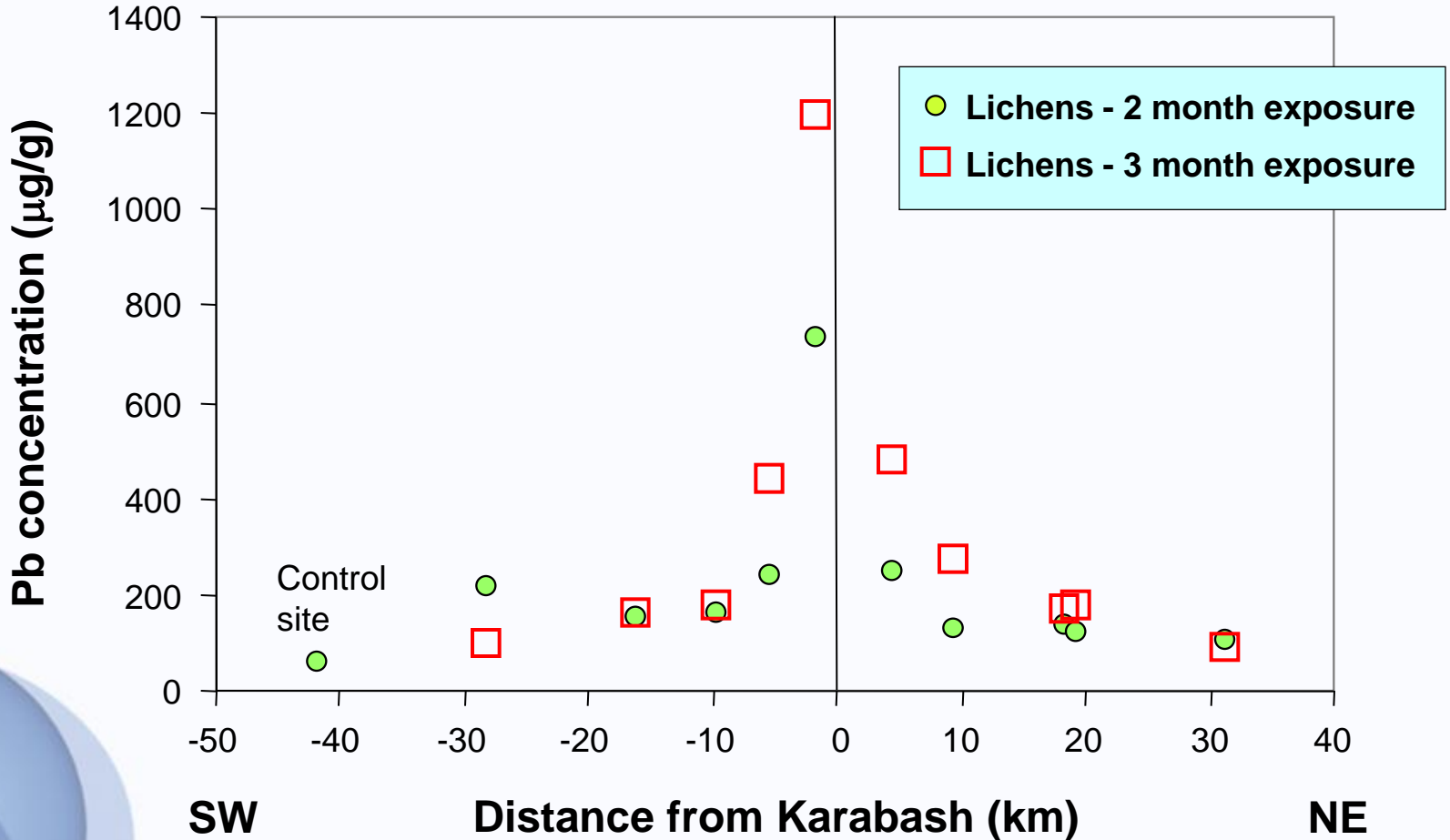
Compendium of methods and tools

Soil-waste mineralogy (Optical RS – PECOMINES)



Compendium of methods and tools

Air pollution (Lichen transplants - MinUrals)



Karabash pilot site (Russia)

- ✓ Description of the environment
- ✓ Map of sources and pathways
- ✓ List of available data
- ✓ Objectives (process and spatialization)



Karabash Environment



Map of impact and effects



Pb 12
Cu 6
Cd 0.2

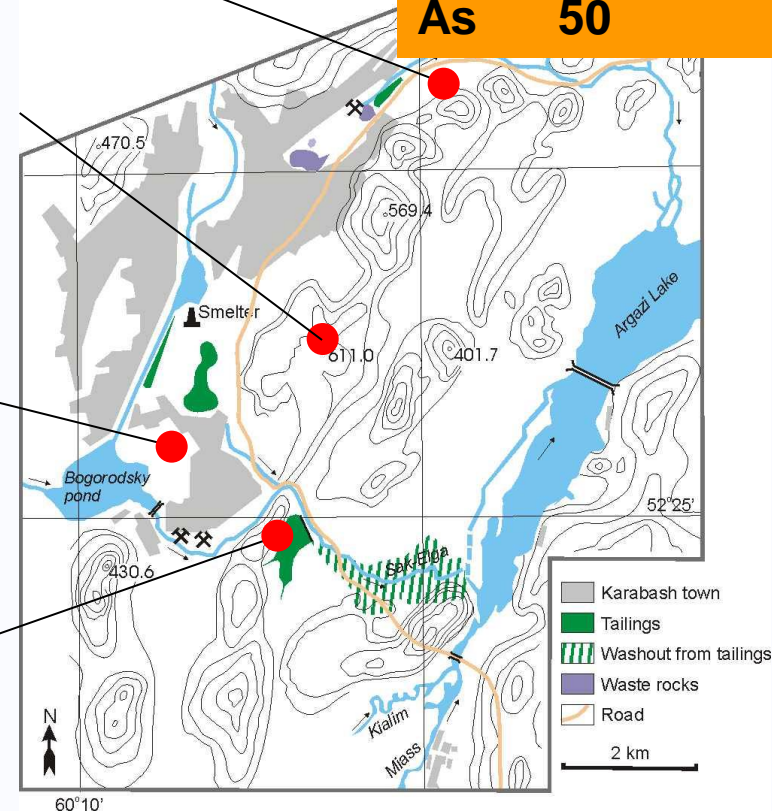
Pb 27
Cu 51
Cd 0.3
As 12

Pb 316
Cu 1314
Cd 492
As 75

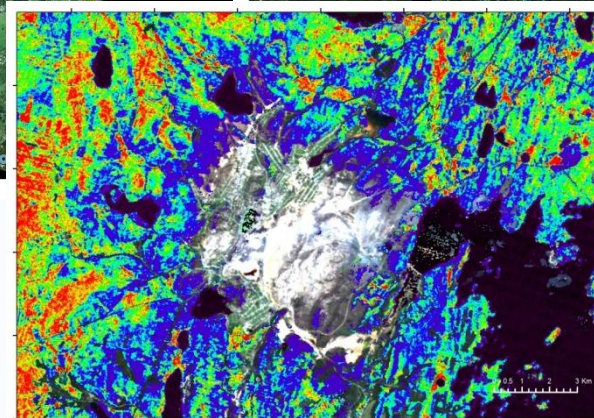
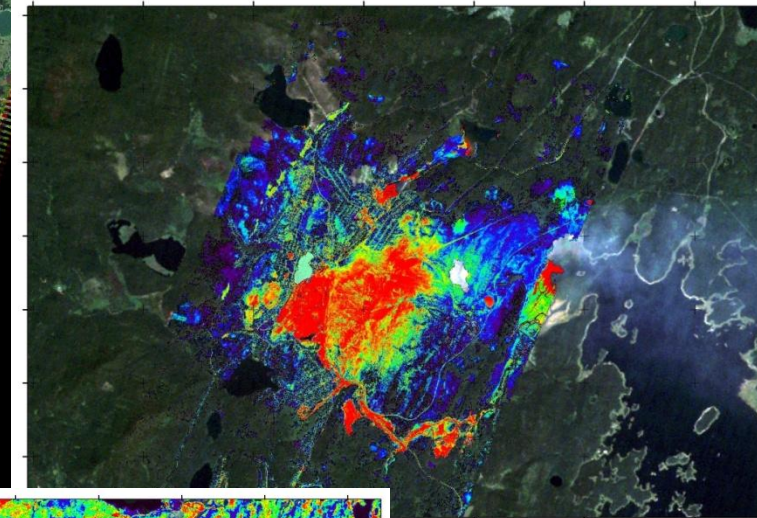
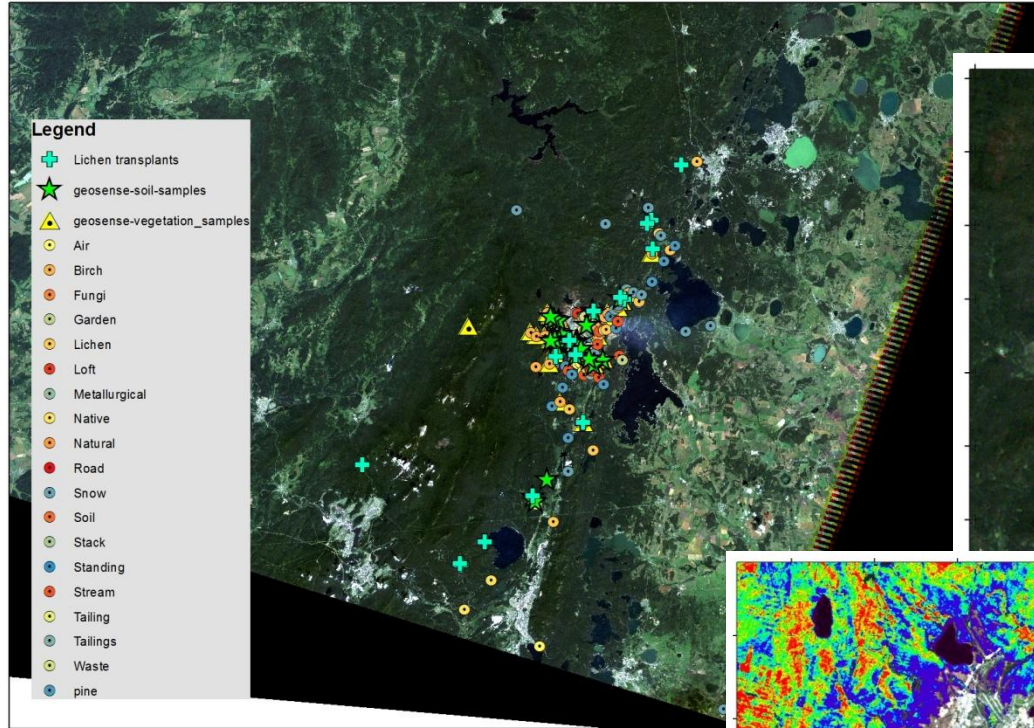
Pb 9
Cu 12
Cd 0.3
As 5

Russian water standard (ppb)

Pb 30
Cu 1000
Cd 1
As 50



Generated data, data need

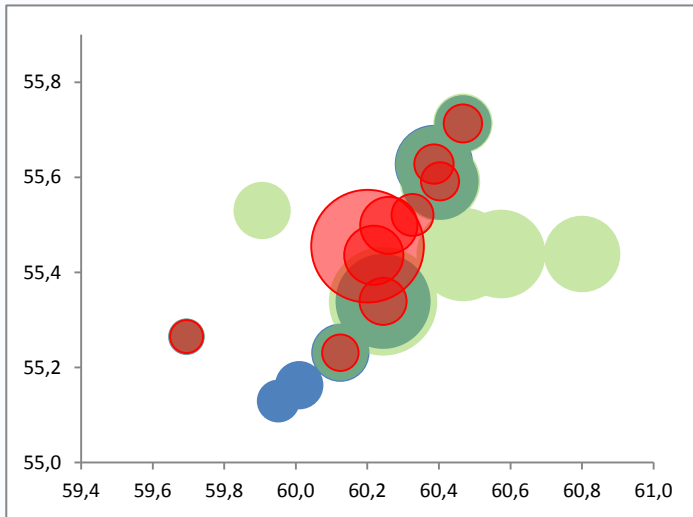


NDVI
Landsat
2011

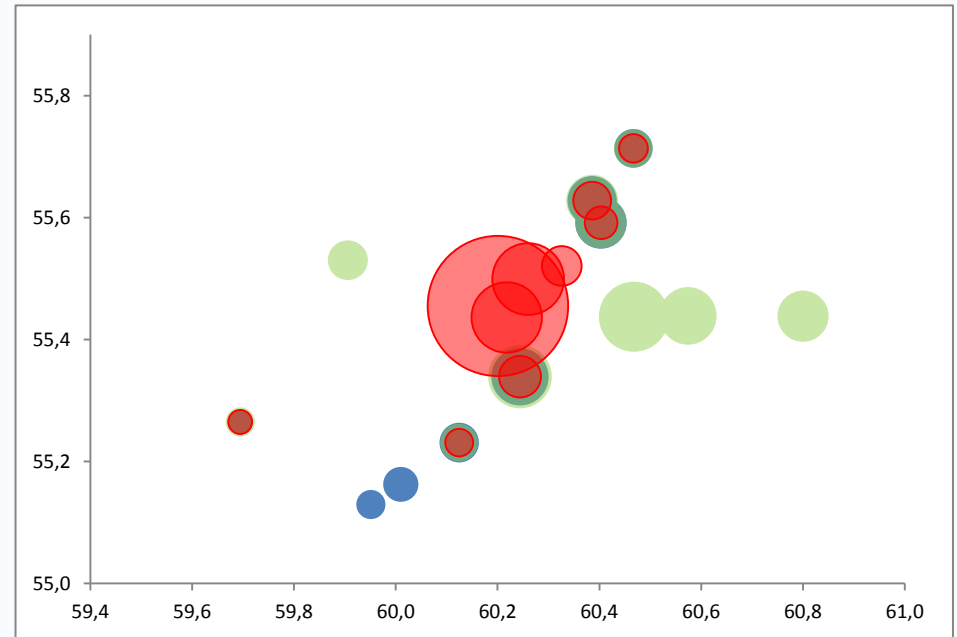


Objective – results (ground work)

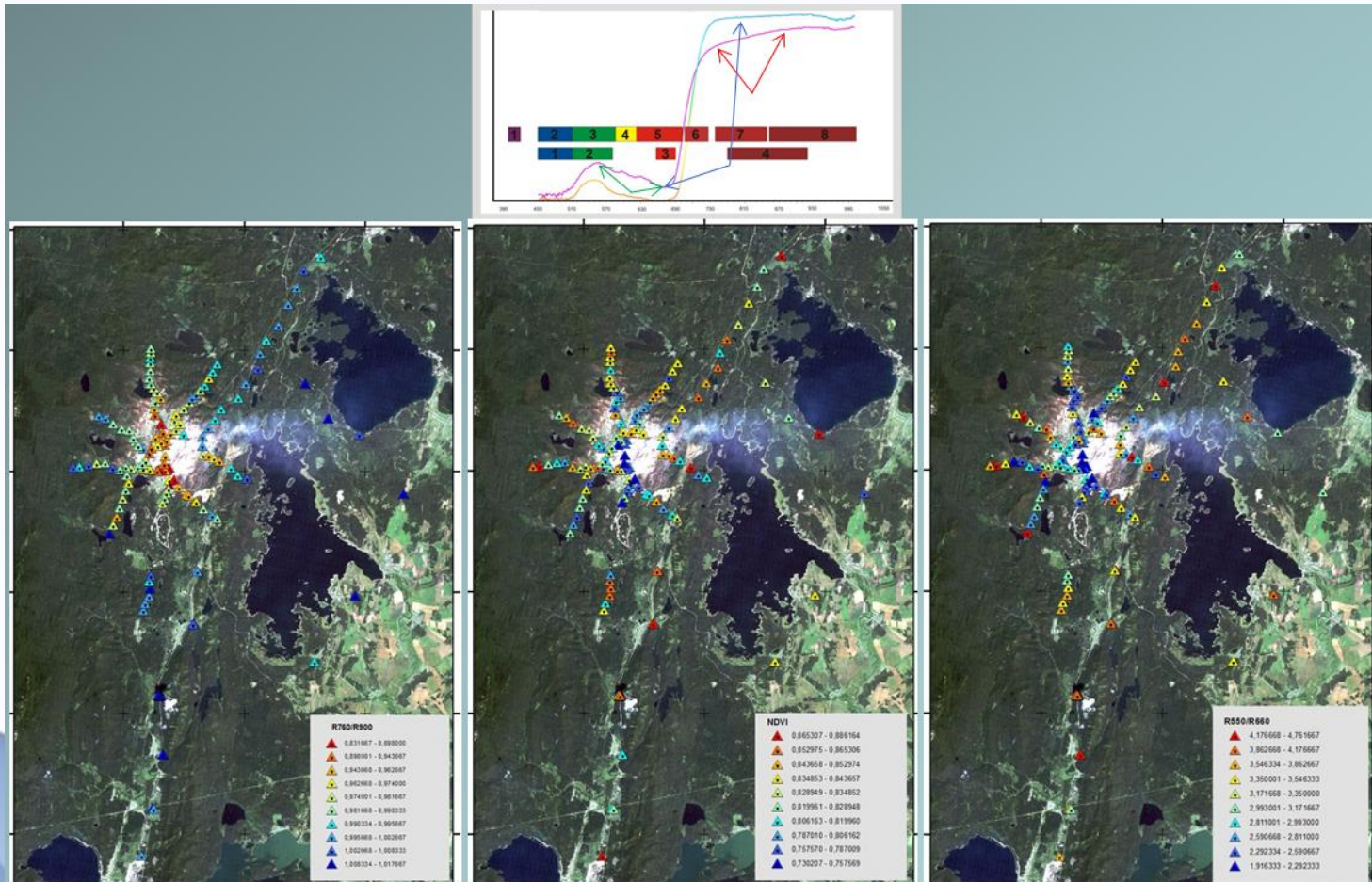
Lead concentration in Lichens:
 Blue native July,
 Red transplants (Sept)



Arsenic concentration in Lichens:
 Blue native (July) Green native
 Sept. Red transplants (Sept)



Objective and results (spectral work)



Thank you for your attention!

www.impactmin.eu
coordinator@impactmin.eu
peter.gyuris@geonardo.com

