



MICA

Minerals Intelligence Capacity Analysis

FACT SHEET

Regional Heavy Mineral Sampling

Heavy mineral sampling is the process of collecting that part of a sample medium that has the highest specific gravity. Regional studies are conducted as part of geochemical prospecting programmes in mineral exploration, in orientation and other studies.

Scope (conceptual model & main characteristics)

Regional heavy mineral sampling is a method used, not only as part of a geochemical prospecting programme in mineral exploration, but also in orientation and other studies. It is the process of collecting that part of a sample medium (soil, stream sediment, sediment, rock or other sample) that has the highest specific gravity. The most common and well known form of heavy mineral sampling is panning for gold. The sampled fraction may then be examined to determine the minerals present in the sample and their quantity. This aids mineral exploration by identifying the type of mineral deposits that may be expected to be found in the region and to aid in vectoring towards such mineral deposits.

It is a technique used to rapidly assess a region at the outset of a mineral exploration programme. Identifying heavy “indicator minerals” can aid exploration by the identification of specific minerals known to be associated with certain mineral deposit types e.g. kimberlite pipes for diamond exploration.

Contexts of use, application fields

- > contexts (e.g., environmental, economic, social assessment)
- > which types of stakeholder questions are concerned?
- > link to published studies that implement the method

Regional heavy mineral sampling is a method used as part of regional prospecting and exploration programmes. It is a method of gathering material for geochemical analysis and is typically used for heavier metals, for example gold or for heavy indicator minerals e.g. magnesian ilmenite. The method is frequently associated with regional geochemical soil and stream sediment sampling.

Input parameters

- > which parameters are needed to run the method

Type(s) of related input data or knowledge needed and their possible source(s)

- > which types of data are needed to run the method, from which sources could they come...
- > could be qualitative data or quantitative data, and also tacit knowledge, hybrid, etc.

Model used (if any, geological mathematical, heuristic...)

- > e.g., geological model for mapping
- > e.g., mathematical model such as mass balancing, matrix inversion, can be stepwise such as agent-based models, dynamic including time or quasidynamic specifying time series...
- > can also be a scenario

System and/or parameters considered

- > **the system can be described by its boundaries.** These can refer to a geographic location, like a country, or a city, the time period involved, products, materials, processes etc. involved, like flows and stocks of copper, or the cradle-to-grave chain of a cell phone, or the car fleet, or the construction sector, or the whole economy...
- > **parameters** could possibly refer to geographic

	co-ordinates, scale, commodities considered, genesis of ore deposits and others...
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Time / Space / Resolution / Accuracy / Plausibility...	-> to which spatio-temporal domain it applies, with which resolution and/or accuracy (e.g., near future, EU 28, 1 year, country/regional/local level...) -> for foresight methods can also be plausibility, legitimacy and credibility...
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Regional heavy mineral sampling is a snapshot in time, however it can contribute to exploration programmes that may have future implications for resource development.

Spatially, it applies to a regional scale, although heavy mineral sampling can be carried out on any scale from local (i.e. individual water courses) to national surveys.

Indicators / Outputs / Units	-> this refers to what the method is actually meant for. Units are an important part but that is most of the time not sufficient to express the meaning. For example, the indicators used in LCA express the cradle-to-grave environmental impacts of a product or service. This can be expressed in kg CO ₂ -equivalent. But also in €. Or in millipoints. Or in m ² year land use. -> for foresight methods the outputs are products or processes
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The main output of heavy mineral sampling programmes is an identification of locations where heavy minerals may occur. Results are frequently expressed in parts per million (ppm)

Treatment of uncertainty, verification, validation	-> evaluation of the uncertainty related to this method, how it can be calculated/estimated
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The method identifies the presence of heavy minerals in a particular sample. It is limited by the selection methodology of the dense fraction and the laboratory procedures applied.

Main publications / references

- > e.g. , ILCD handbook on LCA, standards (e.g. , ISO)
- > can include reference to websites/pages
- > references to be entered with their DOI

<http://inspire.ec.europa.eu/codelist/ExplorationActivityTypeValue/regionalHeavyMineralSampling>

<http://inspire.ec.europa.eu/codelist/ExplorationActivityTypeValue/detailedHeavyMineralSampling>

M. Mange, A & D. Wright, T. (2007). *Heavy Minerals in Use*. Elsevier

Moore, K.R., Moles, N.R. and Lusty, P.A.J., 2016 'A natural laboratory for critical metals investigations in the Mourne Mountains granites' in M.E. Young (ed.), *Unearthed: impacts of the Tellus surveys of the north of Ireland*. Dublin. Royal Irish Academy https://www.ria.ie/sites/default/files/chapter_9.pdf

Related methods

- > List of comparable methods, their particularities...
- > link to one or several other existing fact sheet(s)

Related methods include exploration methods, exploration phases, regional reconnaissance.

Some examples of operational tools (CAUTION, this list is not exhaustive)

- > e.g., software... Only give a listing and a reference (publication, website/page...)
- > **should be provided only if ALL main actors are properly cited**

Key relevant contacts

- > list of relevant **types** of organisations that could provide further expertise and help with the methods described above.

National and Regional Geological Surveys, Mineralogical and geological associations.