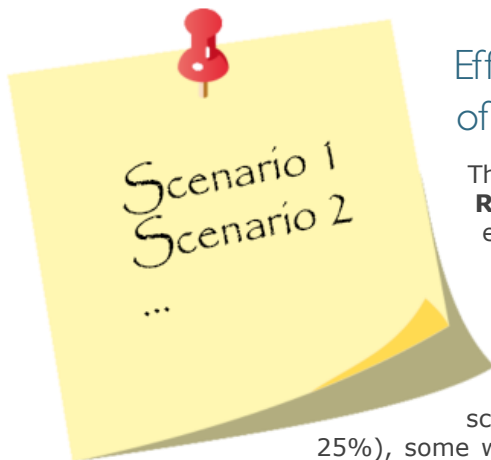




Simulation Reduction with Isatis

To better assess the upside potential and the downside risk of a deposit, it is tempting, given today's power of computers, to resort to conditional simulations and generate hundreds of realizations of mineral grades that are compatible with the data. The question still remains as to how to derive relevant information from this vast array of possibilities in an efficient manner. To that end, we need to find a representative subset of the simulated realizations which best capture the different scenarios.

Isatis Simulation Reduction application offers a quick and easy way to **identify a given set of representative simulated realizations** for further convenient post-processing.



Efficient selection of a subset of representative scenarios

The objective of the **Simulation Reduction approach** is to be able to evaluate projects using a representative subset of simulations selected among a larger set, each realization being associated to a probability of occurrence.

Some realizations would be likely scenarios (with probability above 25%), some would be less likely scenarios, others would be outliers (with probability below 1 or 2%).

The approach is based on the calculation of a **distance** (or dissimilarity) between any two realizations depending on the difference in recoverable metal quantities between the realizations for all the cutoffs over all the panels defining the project.

It consists in selecting the subsets of as many realizations as defined by the user which **best capture the space of uncertainty** as the full set of realizations would do. The most representative subsets are those for which the distance between the selected set and all eligible combinations of the defined number of realizations is minimized.

Industrial characterization of the risk

Because this approach is easy to set up in an industrial context and the selected scenarios are more manageable, it can be implemented to characterize the risk attached to a project due to the uncertainty on the resource for:

- Open pit optimisation and mine scheduling
- Evaluation of projects when taking financial and technical uncertainties into account
- Mine optimization for a portfolio of deposits.

References

- Armstrong M, Ndiaye A, Razanatsimba R, Galli A (2013) Scenario Reduction Applied to Geostatistical Simulations. In: Mathematical Geosciences, February 2013, vol. 45, Issue 2, pp 165-182
- Deraisme J, Bertoli O, Epinoux P (2014) Multivariate Block Simulations of a Lateritic Nickel Deposit and Post-processing of a Representative Subset. In: Journal of The Southern African Institute of Mining and Metallurgy, August 2014, vol. 114

Case study

Scenario reduction has been applied to the Tiébaghi orebody from SLN. Five sets of simulated recoverable grades have been picked up by the procedure (with probabilities of occurrence of 70%, 20% and about a few percents).

*Given the more manageable number of realizations, a characterisation of resource uncertainties has been made possible. From these five representative scenarios, SLN has derived **five pit designs allowing in particular the optimization of the entry sectors for the mining operations.***

Benefits

- Efficient way to take the full deposit variability into account
- Sound algorithm derived from the *Simulation Scenario Reduction in Mining 2-year research project* in collaboration with Cerna, the "Centre d'Economie Industrielle" from the French school Mines ParisTech, and the French Mining Group Eramet.