



## Our **SOLUTIONS**

## **Predictive mapping** for mineral resource assessment and prospecting

BRGM offers you its expertise in mineral resource mapping and predictive assessment. In order to target the zones where deposits of the minerals you require are likely to be found, BRGM offers its expertise in mapping and predictive assessment.

*Nickel-bearing saprolite. Saprolite breccia (ochre) veined with garnierite (green) from the Bonini mine at Poro (New Caledonia, 2010). © BRGM – Valérie Laperche*



Geoscience for a sustainable Earth

**brgm**



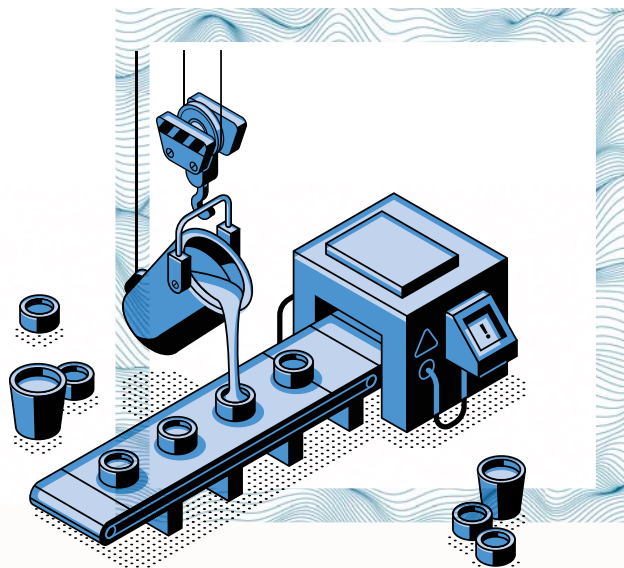


Arfvedsonite star (sodium amphibole) from the alkaline rare earth complex of Kringlerne in Greenland (Greenland, 2013). © BRGM - Nicolas Charles

## YOUR ISSUES AND NEEDS

Predictive mapping enables the rapid targeting of areas that are a priori likely to have deposits and therefore reduces exploration costs and lead times. BRGM has developed many predictive mapping methodologies in order to improve their performance and adapt them to various contexts and data sets. For several years now, these new developments have benefited from data science concepts (machine learning, data mining, etc.).

The results obtained with data-based approaches are systematically evaluated by metallogenic experts to ensure that they are entirely consistent.

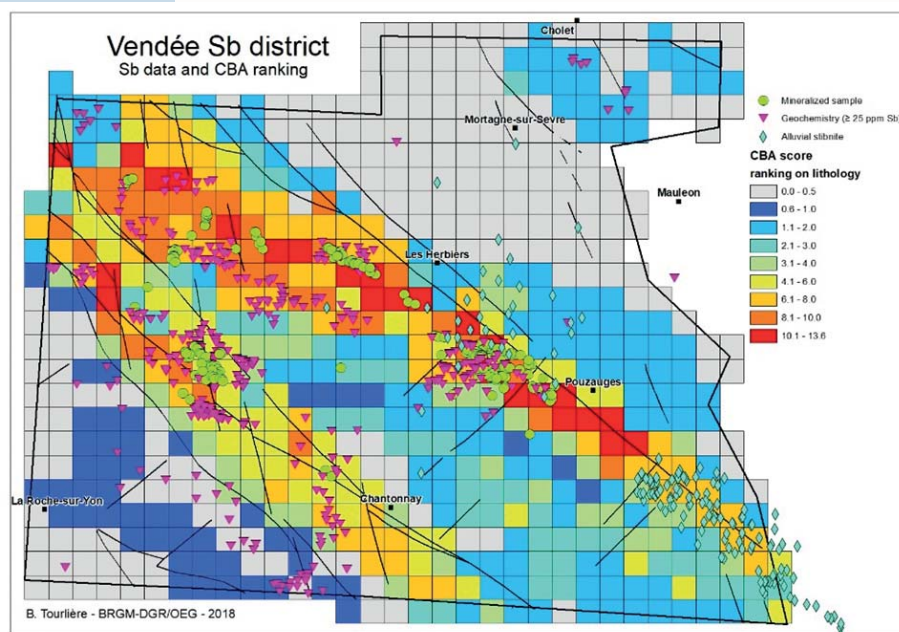


## OUR **VALUE** **PROPOSITION**

BRGM develops its own mineral resource prediction methods to best meet your needs. Thanks to our mastery of all stages of the predictive process, we can assist you in:

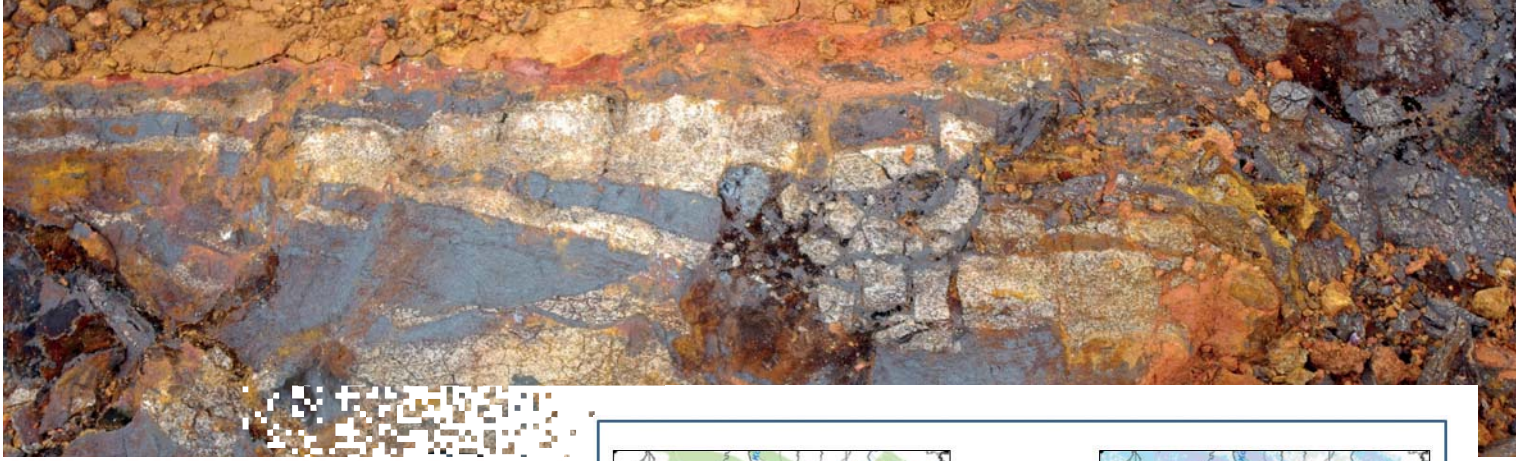
- collecting, compiling and preparing source data.
- implementing predictive processing based on methodologies adapted to particular contexts.
- synthesising and making a critical analysis of the results obtained.

BRGM has developed expertise in predictive mapping both for research projects (in-house or co-financed) and studies for public bodies (French or foreign) or private companies.

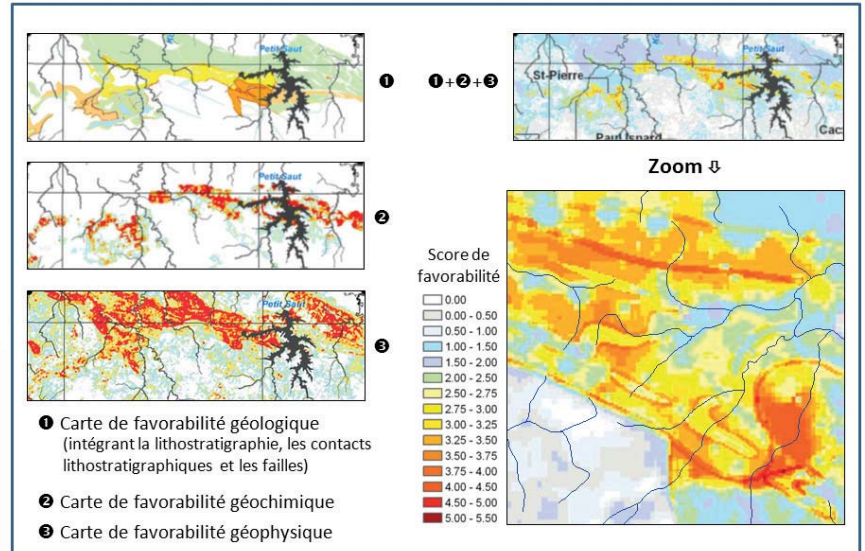


Vendée Sb district: Sb data and CBA score ranking on lithology (2018). © BRGM - Bruno Tourlière





Mining exploration campaign for iron and base metals (Guinea, 2009). © BRGM - Silvain Yart



Gold likelihood map in northern French Guiana: the final map is obtained by adding the favourability scores of the geological, geochemical and geophysical layers. © BRGM – Daniel Cassard

## TOOLS AND SPECIALISED SKILLS

- DataBase Querying (DBQ) and Cell Based Association (CBA): methods developed by BRGM within the framework of European research projects.
- «Classical» approaches to predictive mapping: such as Weight of Evidence, Fuzzy Logic, Random Forest, etc.
- Quantitative Mineral Resource Assessment (QMRA), a probabilistic approach: based on the methodology developed by the United States Geological Service (USGS).
- Data management and geomatics: compilation, management and preparation of data.
- Metallogeny: expertise for the critical analysis of results.

## SOME REFERENCES

### Evaluation of the potential mineral resource «in the ground»:

- Evaluation of the tungsten and antimony potential of metropolitan France.
- Evaluation of the mining potential of Saudi Arabia.

### Predictive approaches from regional to continental scales:

- Predictive maps of Europe for tungsten, tin, antimony, fluorite, zinc, copper, germanium, gallium, indium, tantalum, cobalt and rare earths (European projects ProMine and EURARE).
- Predictive maps of Europe for tailings recovery for gold, gallium, germanium, indium, niobium, lead, antimony, tin, tantalum, tungsten and zinc (European project H2020 Impa@ct).
- Predictive studies at regional scales for the development of mining districts in metropolitan France.

### Research and development:

- Development of innovative approaches (e.g., DBQ, CBA).
- Numerous publications in peer-reviewed scientific journals and presentations at international scientific congresses.
- Development of operational tools for the implementation of «BRGM approaches».
- Organisation of an international conference («Mineral prospectivity: current trends and future approaches», 24-26 October 2017, BRGM, Orléans).





**EDUCATION & TRAINING,**  
*one of BRGM's missions*

BRGM helps to develop scientific and technical skills through both "off-the-shelf" and "tailor-made" training courses, provided by its specific professional training branch: BRGM Formation.

Training course themes :

Geology | Sustainable management of groundwater resources | Mineral resources and circular economy | Environment, land-use projects | Energy transition and underground space | Natural risks, impacts of climate change.



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