



QUÉBEC QUANTIQUE

Enabling the Quebec Quantum Ecosystem

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USE CASE

Quantum Sensors

SECTOR

Natural Resources and Mines

The size of the smart mining market is predicted to increase from USD 6 billion in 2019 to more than USD 20 billion in 2025.



Opportunity The use of quantum physics for mineral exploration will allow for better process optimization, reduced waste and less downtime, leading to improved financial performance¹.



Threat Quantum sensors will eventually render conventional sensors obsolete, and companies that fail to adapt will be at a competitive disadvantage².



Applicable Quantum Technologies

- Quantum Sensors
- Quantum IoT

Commercial Applications

- Magnetometer for deposits detection from mobile stations^{3,4}
- Quantum vibration meter for machinery detection
- Quantum barometer for pressure in mines
- Quantum gravimeter
- Optimization of drilling by reducing the quantity of prospecting holes required⁵

Examples of actors in the innovation chain



DEVELOPPERS



ECOSYSTEM



USERS

Created in collaboration with



Public partner





USE CASE: Quantum Sensors

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Factors Preventing Adoption

Magnetometers and quantum sensors are not yet ready for large-scale commercial applications. There is still research to be done and pilot projects will be needed to fine-tune the technology as well as its software supports.

Current operating conditions are strict in terms of cleanliness, vibration levels and temperatures, but improvements are constantly being achieved. Considering the additional data points and increased sensitivity offered by this technology⁶, it will have no choice but to be adopted eventually.

Risks of the Status Quo

Prospecting is as much an art as it is a science, as it relies on experts to read and analyze the data offered by sensors, in order to infer what might be under the ground, and whether a site is interesting and profitable for mining. Experts who use data taken from old technology will have less success than those who follow technological advances.

Quantum technologies represent a breakthrough in the world of sensors, because the amount of data it can offer as well as its precision exceeds what can be offered by current technology. Thus, a mining company that takes its soil readings using these sensors increases its chances of profitability, or at least can make more informed decisions.

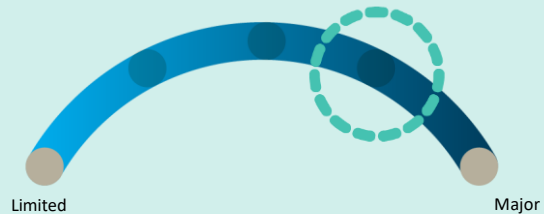
The size of the smart mining market is predicted to increase from USD 6 billion in 2019 to more than USD 20 billion in 2025⁷. This market will allow less expensive prospecting, and a reduced ecological impact since it will require fewer prospecting holes to be dug.

OPPORTUNITY Window



Given the acceleration of the latest advances in quantum sensors, mining companies will soon be able to use these sensors to their full capacity. In the meantime, they can use them in collaboration with conventional sensors until the technology is fully ready. Mining companies with experts that will already know how to interpret the data and manage this new technology will have a competitive advantage and will be among the first ones to benefit from a quantum advantage.

POTENTIAL Impact for Businesses



The impact will be high, as more data points will allow experts to make more informed and less risky decisions. Indeed, decisions often have impacts over several years and require considerable sums of money, so having a greater amount of data, and more reliable data will lead to a competitive advantage.

1. <https://www.azoquantum.com/Article.aspx?ArticleID=184>
2. https://nrc.canada.ca/sites/default/files/2019-03/sdt_quantum_symposium_en_hr.pdf
3. <https://www.mckinsey.com/industries/advanced-electronics/our-insights/shaping-the-long-race-in-quantum-communication-and-quantum-sensing>
4. https://nrc.canada.ca/sites/default/files/2019-03/sdt_quantum_symposium_en_hr.pdf
5. <https://www.pmc.gov.au/sites/default/files/publications/ctpc-co-tech-cards-quantum-sensors-aust.pdf>
6. https://nrc.canada.ca/sites/default/files/2019-03/sdt_quantum_symposium_en_hr.pdf
7. <https://www.statista.com/statistics/658055/smart-mining-market-size-forecast/>



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Québec Quantique aims to promote the adoption of quantum technologies by Québec businesses and organizations.

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