

## **Turning tax dollars into diamonds with Big Data**

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Government organisations can play a significant role in facilitating exploration for mineral resources by collection and delivery of comprehensive data. Diamond exploration is conducted by geophysical surveying, and identification of rocks and indicator minerals suggesting associations with diamond. Government organisations have the opportunity to provide significant added value to historical ground surveying in ways that are unaffordable to smaller exploration companies and provide transparency that larger companies are unwilling to provide. Diamond exploration databases deliver comprehensive data and knowledge of prior exploration from what otherwise would be poorly accessible and disparate sources, in addition to previously confidential data sometimes provided in bulk by larger stakeholders. Compilation of such historic data imposes necessary quality control and consistency of classification, allowing for a much better overview of the assumptions, shortcomings and value of local surveys than would otherwise be possible. Data can be delivered in a range of levels of sophistication and cost, and with an associated range of benefits.

Case studies of four databases, from Greenland, Manitoba, and the Northern Territory and Western Australia reveal that costs vary depending on metrics such as the size of the study area, the number of data sources and the quantity of data. However, combining variables shows an overall consistency between the four case studies allowing predictions to be made of the costs of future projects. Depending on whether data are delivered as-reported, or with enhancements such as spatial delivery through GIS, or detailed prospectivity analysis, the manpower costs range from \$0.04 to \$0.21 USD per square kilometre. For example, the January 2020-published Greenland Diamond Exploration Database, incorporating prior work in 2004 is estimated to have cost a total of \$400,000 USD for a land area covering 2.2 million square kilometres. Statistics from diamond-producing nations show the cost of creating a database is equivalent to 0.3–1.8% of one percent of yearly diamond production. Such costs are hard to justify for a junior company but well within reach of a government organisation with a track record or aspirations to be a diamond-producing jurisdiction.

The Geological Survey of Western Australia conducted detailed studies of the impacts of its Exploration Incentive Scheme. However, few government agencies keep detailed records of exploration expenditure per commodity so the impacts of databases are typically constrained to case studies. Ground has been staked at Oscar and Mount Hann as a direct result of 2018 database release in Western Australia and kimberlite discoveries were made at Knee Lake and Monument Bay promoted by the Manitoba database. Publication of the 2004 database directly led to the discovery of the Garnet Lake kimberlite in Greenland, a project which yielded the largest stone to be recovered from an early-stage mini-bulk sample in North America.

Comparison of costs against benefits support the recommendation that industry continues to lobby governments to provide such data resources. Larger companies would benefit from seeing the overall value to the industry by collaborating with such projects, and government agencies would benefit from more routinely publishing metrics which allow critical assessment of the impacts of the products they provide.