

COOPERATIVE GEOLOGICAL MAPPING STRATEGIES ACROSS CANADA

1. INTRODUCTION

The Action Agenda for Mining in Canada, endorsed by federal, provincial and territorial Mines Ministers following their 56th annual meeting, recognized the key role of geoscience knowledge in making Canada a pre-eminent global destination for investment dollars. Ministers undertook to consider strategies to achieve adequate funding levels and to work to address a 10-year goal to substantially improve the geoscience knowledge base across Canada. The present document, prepared by the National Geological Surveys Committee in consultation with the industry, responds to the Ministers' direction to develop cooperative mapping strategies for Canada.

2. BACKGROUND

The publicly accessible store of reliable geoscience knowledge across Canada is widely acknowledged as a key competitive advantage in attracting investment in the increasingly competitive global mineral and petroleum exploration market. However, the mineral mining and exploration and petroleum industries have argued that this relative competitive advantage has been put at risk for a number of reasons, including:

- A) There remain significant areas, particularly in northern and remote regions in Canada, for which geological, geophysical or geochemical maps are either non-existent or at such a coarse scale that they provide little guidance to exploration.
- B) The usefulness of previously acquired data is gradually eroded by advances in scientific understanding and the introduction of new, more precise survey technologies.
- C) Principal competing nations for exploration investment are rapidly upgrading their own stores of geoscience knowledge.

The state of the geoscience knowledge base was examined at a multi-stakeholder workshop held in 1997 in conjunction with the 54th Mines Ministers' Conference in St. John's, Newfoundland. The workshop report drew particular attention to the protracted decline in the cumulative investment in geological survey activities by governments.

In response, industry and the Intergovernmental Working Group on the Mineral Industry (IGWG) established an industry-led task force to investigate alternative funding arrangements for geological surveys. The task force report presented to the 55th Mines Ministers' Conference in

Calgary, Alberta, concluded that geological survey activities are fundamentally a public good that should be funded by governments through either appropriation or a dedicated revenue stream from existing taxes, fees and levies collected from the industry.

IGWG then asked the task force for an assessment of the level of funding that would be required to sustain the competitive advantage afforded by the geoscience knowledge base in Canada. Recognizing that complete coverage of the Canadian landmass at the optimum scale is not a realistic short-term goal, the task force asked each jurisdiction to identify the key gaps in geological, geophysical and geochemical map coverage that should be addressed over a 10-year time horizon. The findings were presented at the 56th Mines Ministers' Conference held in Charlottetown, PEI, in September 1999. The task force estimated that a total incremental¹ investment of \$363 million would be required over the next 10 years to fill priority gaps in surface map coverage. The task force also estimated that the cost of providing the subsurface mapping needed to support hydrocarbon exploration would total \$240 million over 20 years.

3. PRINCIPLES

The proposed Cooperative Geological Mapping Strategies are based on the following principles:

- 3.1 The strategies respect the jurisdictional responsibilities of each order of government in all provinces and territories of Canada.
- 3.2 They will address the geoscience priorities in each jurisdiction.
- 3.3 Their implementation will be compatible with geoscience agreements between provinces or territories and the Geological Survey of Canada (GSC) where they exist, or will flow from specific project agreements between provinces, territories and/or the GSC.
- 3.4 Joint funding and delivery mechanisms will be sufficiently flexible to allow all jurisdictions to participate.
- 3.5 All knowledge generated as a result of projects carried out under the strategies will become the joint property of and be fully available to the GSC and the provincial or territorial geological survey that participated in the projects. The parties will jointly make this knowledge available to clients in a timely, easily accessible and seamless fashion, through appropriate mechanisms.

4. GOAL AND OBJECTIVES

The goal of the Cooperative Geological Mapping Strategies is to ensure that enhancing the geoscience knowledge base will play a key role in re-establishing Canada as a pre-eminent global destination for exploration dollars and in providing a sound basis for resource stewardship. To achieve the goal by the year 2011, implementation of the cooperative geological mapping strategies must begin in April 2001.

The economic objectives of the Cooperative Geological Mapping Strategies are:

- 4.1 Increase investment in mineral and energy exploration;
- 4.2 Stimulate new discoveries;

¹ That is, the difference between the total cost of achieving the desired level of map coverage and the level of funding currently devoted to such mapping activities, summed across all jurisdictions.

- 4.3 Identify new, previously unrecognized resources in mature areas; and,
- 4.4 Help ensure sustainable development.

Thus, the strategies will support resource stewardship and help create wealth, stimulate economic activity and job creation, and generate tax revenue. At the same time, they will support sustainable resource management. The projected impacts of the strategies are summarized in Annex A.

The associated technical objectives are:

- 4.5 Fill important gaps in subsurface and surface geological map coverage across Canada. This includes:
 - 4.5.1 Mapping areas that have not been mapped at all, or that have not been mapped at a satisfactory scale;
 - 4.5.2 Incorporating advances in the understanding of fundamental geological processes; and,
 - 4.5.3 Repeating geophysical surveys to modern standards.
- 4.6 Present the results to clients (prospectors, exploration and mining companies, oil and gas producers, provincial, territorial and federal government departments) in a format that makes them easy to understand and use, through appropriate mechanisms.

5. COOPERATIVE STRATEGIES

A cooperative geological mapping strategy will be developed for each participating province or territory. These strategies will be delivered through a series of collaborative projects undertaken by the provincial or territorial geological survey organizations and the GSC in a manner that respects the jurisdiction of each order of government, and in agreement with the principles outlined in Section 3. The collaboration can involve any of the provincial, territorial and federal geological survey organizations.

In general, the activities of the provincial and territorial geological survey organizations will be specific to the economic development and resource management of their own jurisdictions. These will be carried out at a scale appropriate to addressing provincial or territorial responsibilities, and contribute to a systematic description of the geology of the provinces and territories, including their mineral, energy and groundwater resource endowment. Provincial and territorial geological survey organizations will also cooperate in mapping border regions, when appropriate.

In general, the activities of the GSC will be thematically based, and Canada-wide or broadly regional in scope and significance. They may include aspects of specialized research, technology application and information management not contained in the programs of all the provincial and territorial survey organizations.

Specific delivery strategies are outlined in Annex B.

Implementation of the Cooperative Geological Mapping Strategies is predicated on the availability of new funding, and it is envisaged that both orders of government will make equal contributions. While different funding ratios may be negotiated, both orders of government will provide new funding where possible.

It is recognized that the geoscience needs and budget priorities are different in each jurisdiction, and that ministers are not yet in a position to indicate what level of funding support might be accorded to the Cooperative Geological Mapping Strategies. It is proposed that, as a first step, the Minister of Natural Resources Canada determine the total amount of federal funds that would be

available for investment in the strategies. The provincial and territorial ministers would then, in turn, indicate how much their respective jurisdiction is prepared to invest. The final allocation of funding to the Cooperative Geological Mapping Strategies in each jurisdiction would then be determined through bilateral negotiations. The allocation of budgets to projects within each jurisdiction would be in accordance with the governance mechanisms outlined below.

6. GOVERNANCE

Priorities for collaborative projects will be established and projects will be carried out in accordance with existing agreements and practices. The federal-provincial/territorial Cooperation Committee in each province and territory, or such committee as may be acceptable to the Geological Survey of Canada and the provincial/territorial geological survey, will be responsible for program management within its province or territory. These Cooperation Committees are advised by Technical Advisory Committees that have strong industry representation. Where study regions cross provincial or territorial boundaries, the Cooperation Committees involved will jointly manage cross-boundary projects and ensure that coordination takes place.

The National Geological Surveys Committee (NGSC) will coordinate the implementation of the Cooperative Geological Mapping Strategies at the Canada-wide level. An NGSC Advisory Board, consisting of representatives from the Technical Advisory Committees in each jurisdiction and from academia, will review the overall implementation of the strategies in terms of alignment with the goals, synergy, and Canada-wide priorities, and will make recommendations accordingly to the NGSC. Where appropriate, the NGSC will recommend to the federal-provincial/territorial Cooperation Committees or their equivalents adjustments that improve coordination of the program. The Cooperation Committees will take these recommendations into account when allocating resources to projects and will assume responsibility for execution of the program within their province or territory.

A Coordinator will be appointed who is in charge of:

- ✓ Monitoring the strategies developed across Canada (standards, networks, project interaction and complementarity, reporting to ministers, *etc.*);
- ✓ Promoting the program to federal, provincial and territorial agencies to support their marketing to investors and the minerals and petroleum industry across Canada and globally;
- ✓ Monitoring progress;
- ✓ Reporting;
- ✓ Supporting the NGSC in all of its duties related to the Cooperative Geological Mapping Strategies.

The Coordinator will be supported by a Secretariat. Both the Program Coordinator and the Secretariat will be provided by Natural Resources Canada and will report to the NGSC.

7. EVALUATION FRAMEWORK

Each federal/provincial Cooperation Committee will review progress annually. The results of the reviews will be presented to the NGSC. A report will be presented periodically to the Mines Ministers' Conference.

Impact studies will be commissioned after five years and at the completion of implementation.

ANTICIPATED IMPACTS

The impacts of the Cooperative Geological Mapping Strategies on resource exploration and development are expected to be wide-ranging and are summarized below.

1. Increased Exploration Activity

It is widely acknowledged that the information provided by government geological surveys often leads to new exploration activity by the private sector. Although it is difficult to quantify this impact with any certainty, a recent analysis of the literature² provides a basis for estimation. Accordingly, it is estimated that every \$1 million of government investment to enhance the geoscience knowledge base will likely stimulate \$5 million of private exploration expenditures which, in turn, will result in the discovery of new resources with an *in situ* value of \$125 million. There are no known studies that give analogous multipliers for oil and gas exploration; however, they would likely be the same or even larger.

2. Increased Employment

The value of job creation (direct and indirect) resulting from the additional exploration is estimated to be 47 cents per dollar of exploration activity based on impact multipliers of the Statistics Canada input/output model for services incidental to mineral extraction. This implies that each \$1 million invested by governments in the strategies would result in 40 person-years of employment in the private sector. This is over and above the approximately 10 person-years of employment per \$1 million expenditure generated directly by the government in program delivery.

3. Environmental

The geoscience knowledge that fosters resource exploration also provides important information for land-use planning decisions. The fact that necessary data are already "on the shelf" reduces both the cost and time required for environmental assessments.

4. Highly Qualified People

The industry has raised concerns about a shortage of geoscience graduates with appropriate field training. Government geological surveys have traditionally played an important role in training university students through summer field programs and support of thesis research. It is estimated that each \$1 million in government investment would provide such training for five students.

2 *Refinement and Validation of a Costs, Benefits and Impacts Model for the Targeted Geoscience Initiative*

ECONOMIC AND TECHNICAL STRATEGIES

1. To increase investment in mineral and energy exploration

Provide a high-quality, unbiased geoscience knowledge base, aggressively market the program, and build a networked community of investors, explorationists, regulators, non-governmental organizations and program geoscientists.

High-quality, unbiased information reduces investment risk and provides a context within which to interpret claims made by exploration companies. Marketing raises the awareness of the availability of the information, and networking allows all parties to communicate and share the same basic government geoscience information. This helps avoid misunderstandings and facilitates problem-solving.

2. To stimulate new discoveries

Achieve technical objectives 4.5.1 and 4.5.3, use modern information technology to provide easy access to program data, and work closely with the exploration community.

Providing digital information in a timely fashion and in suitable formats allows it to be used effectively by the energy and mineral exploration sectors' sophisticated software applications. This helps reduce exploration risk and speeds up the discovery process. At the same time, it allows appropriate land-use decisions to be made, thereby supporting objective 4.4.

3. To identify new, previously unrecognized resources in mature areas

Achieve technical objectives 4.5.2 and 4.5.3, comprehensively integrate new and existing information in mature areas, and develop a new interpretation of mineral and energy resource potential in light of the most current geoscientific theories.

This type of approach has proven to be useful in the past. Close cooperation with universities will ensure awareness and use of current geoscientific theories.

4. To help ensure sustainable development

Aspects of the knowledge generated that are relevant to land access, land use, and environmental matters will be identified and brought to the attention of relevant parties.

5. To fill important gaps in surface and subsurface geological map coverage

Identify and prioritize needs with clients for each jurisdiction, develop a joint federal-provincial/territorial program to meet the needs (including quality standards), and implement the program and monitor progress through appropriate mechanisms in accordance with the principles outlined in Section 3.

Most of the mechanisms needed are already in place.

6. To allow presentation of the results to clients in a format that makes them easy to understand and use

The National Geological Surveys Committee, a cooperative committee of provincial, territorial and federal geological surveys, will continue to develop the Canadian Geoscience Knowledge Network (CGKN) to provide appropriate interfaces and links between the information technology infrastructures of the parties to establish a modern distributed information technology approach.

To maximize its utility, the geoscience information produced under the program will be readily available in formats that facilitate integration with other information. The CGKN will help the investment and exploration communities obtain easy access to geoscience maps and information on the information highway, and will develop mechanisms that allow one-window access to the information holdings of the various geological survey agencies. Each agency will continue to manage and maintain its own information holdings and identity.

7. Human resources

A creative human resources approach will help recruit new talent (*e.g.*, young scientist program) and enthuse and retain present staff. It will build capacity and develop and maintain skills that are in decline across Canada.