Leveraging GEOIDE: Developing a Collaborative Research Strategy

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ABSTRACT

The GEOIDE (GEOmatics for Informed DEcisions) Network, created in 1998, is a member of the Canadian National Networks of Centres of Excellence (NCE) aimed at mobilizing Canadian researchers towards the development of the national economy and the overall improvement of the quality of life of Canadians.

The GEOIDE Management Board realizes excellence in research must be augmented by awareness, collaboration, and partnership. GEOIDE is focussing on expanding partnerships and collaboration in two areas. The first is among academic, industrial and government researchers to develop new technologies and methods. The second is with government agencies to deploy technologies and methods that will empower them to manage the environment for long-term sustainability.

Canada's universities have an immense research capability that needs good direction to work well on behalf of Canadians. GEOIDE acts as a broker to define and initiate research projects that are of interest both to GEOIDE clients and the research community. There is no question that GEOIDE's research projects are of interest to many; however, there is a need to understand how each stakeholder can make the best use of GEOIDE through related research investments. This paper discusses how GEOIDE can be part of a joint investment strategy to provide the best return in the long haul.

Keywords: Excellence, Investment, Partnership, Collaboration, HQP, Market Penetration

1 INTRODUCTION - WHAT IS GEOIDE?

The GEOIDE Network, created in 1998, is a member of the Canadian National Networks of Centres of Excellence (NCE). The NCE program has 22 Networks of Centres of Excellence throughout the country. The NCE program aims to mobilize Canadian researchers from the academic, private, and public sectors towards the development of the national economy and the overall improvement of the quality of life of Canadians. Each Centre has a specific mandate within a particular sector.

The GEOIDE NCE has a mandate to act as a catalyst to strengthen the impact of strategic research in the Geomatics community in Canada. In the role of catalyst, GEOIDE has been actively developing alliances to consolidate and strengthen the Canadian Geomatics industrial and academic sectors.

1.1 GEOIDE Network Management

The GEOIDE NCE was established to consolidate and expand Canadian expertise in Geomatics. A Board of Directors manages GEOIDE. Its membership is drawn from various GEOIDE network management committees, private sector partners and the NCE program. The board includes:

- a representative of each Network Partner,
- appointed Network Affiliates and/or industrial representatives to ensure the participation of SMEs (small to medium enterprises),

- an elected industry member, chosen by the Network Affiliates,
- an elected Network Investigator,
- three university representatives--one from the host university and two elected by the university partners.

The Board may appoint additional representatives as required, up to a maximum of 20. A representative from the non-traditional Geomatics sector also holds a seat on the Board. Non-traditional sectors are those outside the natural resource, surveying and mapping areas. A student observer is appointed to the Board to ensure an appropriate venue of the GEOIDE Students' Network. The Board oversees:

- the GEOIDE Students' Network (GSN),
- the Research Management Committee (RMC),
- the Technology Utilization Committee,
- the Business Development Marketing Committee,
- the Program and Associate Program Leaders.

The relationship between each of the management components is shown in Figure 1-4. On an operational basis, the Scientific Director reports to the CEO and is responsible for directing the research agenda and the management of the Business Centre, and for ensuring that the Business Centre serves the Network as a whole. The Associate Scientific Director and a Network Manager assist the Scientific Director. Dr. Keith Thomson is the CEO and Dr. Geoffrey Edwards is the Scientific Director.

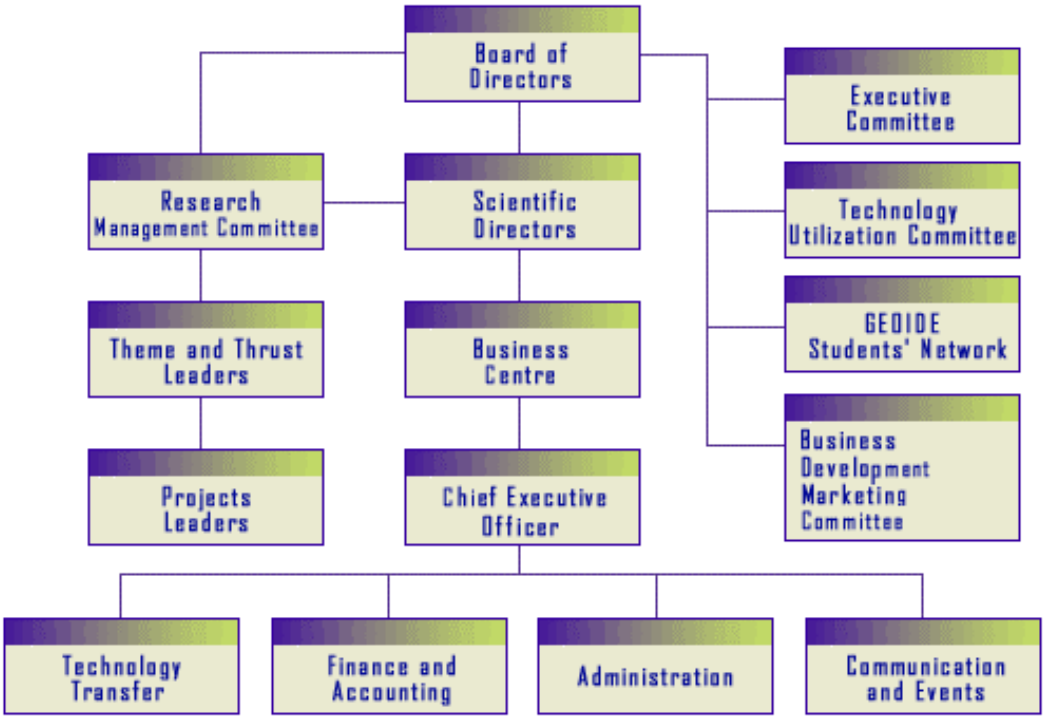

Figure 1: Overview of the GEOIDE NCE Network Management Structure

More information about the management and operation of GEOIDE is available from the website at http://www.geoide.ulaval.ca/an/about/management.html.

1.2 Long Term Objectives

The mandate of the GEOIDE NCE is to be a catalyst to strengthen the impact of strategic research in the Geomatics community in Canada. Its actions are to:

- create and/or bolster strategic research and development alliances,
- consolidate efforts to migrate the results of research to the commercial arena,
- strengthen the Canadian Geomatics industrial and academic sectors,
- provide the technologies and methods to empower government bodies to better manage our environment for long-term sustainability.

Within the Canadian Geomatics community, GEOIDE recognises that it must expand the strategic national alliances necessary to consolidate and strengthen the domestic Geomatics industry, while making optimum use of Canada's R&D capabilities. Each partnership must incorporate the research and development priorities of all participants and affiliates. In support of this mission, GEOIDE has worked to these ends.

- ***Create a self-sustaining network*** of Geomatics Researchers, Solution Providers, and Users to oversee and promote the long term development of Geomatics and ensure that it generates lasting benefits throughout Canadian society.
- ***Implement a multi-disciplinary R&D investment program*** to generate a return to public and private sector participants through their utilization of new knowledge created.
- ***Ensure that the results of the R&D investment program are commercialised,*** thereby contributing to Canada's social and economic development, and creating an atmosphere of trust between researchers and commercial vendors.
- ***Develop, and provide for the retention in Canada, of outstanding researchers*** who also assist in the training of professional and technical staff in the public and private sectors.
- ***Provide a forum for the exchange of knowledge, products, services, and personnel*** between the different stakeholders from the Canadian Geomatics R&D community.
- ***Accelerate the adoption of Geomatics technologies and methods*** throughout Canada among groups not necessarily familiar with the technology but who would benefit directly or indirectly from it.

This set of objectives demands a strong and diverse team of committed partners. The initial partners in GEOIDE include a wide range of participants, including:

- Canadian Space Agency (http://www.space.gc.ca/)
- Department of National Defence, Defence Research Establishment Valcartier (http://www.drev.dnd.ca/)
- Natural Resources Canada (http://www.NRCan-RNCan.gc.ca/inter/index.html)
- Centre for Earth and Space Technology: CRESTECH (http://www.crestech.ca/)
- Fisheries and Oceans Canada (http://www.dfo-mpo.gc.ca/home-accueil_e.htm)
- MacDonald Dettwiler and Associates (http://www.mda.ca/index.shtml)
- Quebec Ministry of Natural Resources (http://www.mrn.gouv.qc.ca/)
- Université Laval, Québec, (http://www.ulaval.ca/

In addition to being a network partner, Université Laval also houses the Network Business Centre.

GEOIDE brings together many of the country's leading experts from academic, government, and industrial institutions. Beyond the partners, the GEOIDE network has a healthy mix of private sector affiliates (47 companies), government (36 agencies), and academia (27 Universities), with over 140 researchers and 300 students and post-doctoral fellows (see Appendix A for a list of participants). In several projects this official list of students and affiliates has been augmented by links to local colleges and cooperative programs.

In its short existence, GEOIDE has been successful in addressing the requirements of the initial participants; however, key structural components of the program must be augmented by awareness, collaboration, and partnership to ensure long-term benefits from the research network. To be an effective catalyst requires the creation of partnerships across multiple disciplines and research sectors. Consequently, GEOIDE is focussing on building and extending partnerships for collaboration in key areas and jurisdictions. Recently, the GeoConnections program has teamed with GEOIDE to help implement the GeoConnections Skills Network.

2 GEOIDE PARTNERSHIP STRATEGIES

To foster long term viability, effectiveness, and growth, GEOIDE is focussing on extending partnerships and collaboration. The first objective is to increase collaboration with the environmental and marine academic, industrial, and government agencies.

A parallel objective is to identify how to provide the technologies and methods to empower the various government bodies in the region to better manage our environment for long-term sustainability. To this end, GEOIDE would like to enhance the use of Geomatics in environmental issues with the particular goal of having an expanded set of network partners in this vertical sector.

To establish effective partnerships, all parties need to understand what GEOIDE is and what components of the GEOIDE Network can best benefit the stakeholders. This paper articulates concrete goals for a proactive and effective research partnership that will share information, research outcomes, and strategic investment. Some specific technologies and research sectors where GEOIDE offers immediate value include:

1. Data acquisition

- Geodesy
- Geoid cartography
- Canadian Spatial Reference System
- Positioning techniques
- In situ sensors

2. Remote sensing

- Satellite and airborne imaging
- High resolution optical imaging
- Satellite and airborne hyperspectral imaging
- Satellite and airborne radar imaging
- Total station (engineering scale)

3. Cartography

- Base maps (NTS scale)
- Revision mapping
- Digital terrain model
- Thematic (geographic) mapping (NTS, planning and engineering)
- Cadastral surveying, property mapping
- Maintenance of peripheral units and limiting
- Digital map production
- Geographic Information System (GIS)
- Generalization and standards for cartographic and geospatial data sets

4. Data management and data dissemination

- Database design and management
- Process control and update
- Real time mapping, feature identification and extraction, update and conflation
- Interoperability through common models and interfaces based on open specifications
- Use of internet for the dissemination of Geomatics data

- User interface improvement

5. Decision support

- Decision support tools
- Data fusion (multiple databases, multiple communities, multi-discipline)
- Social environmental modelling
- Decision process and modeling
- Coastal zone management
- Emergency Response
- Geographic Information System application extensions
- Matrix and vector computations and representations
- Artificial intelligence, algometric geometry, cognitive science

This list is by no means exhaustive, but provides an indication of the breadth of research carried out by GEOIDE.

3 LEVERAGING THE VALUE OF THE NETWORK

GEOIDE functions as a strategic link to research funding and provides access to world-class expertise in the field of Geomatics. GEOIDE selects and oversees R&D projects by way of its research investment program. The GEOIDE Research Management Committee (RMC) oversees the selection of the R&D projects and interacts directly with the Project Leaders. Projects chosen for funding are organized into Themes and Thrusts (Figure 2). Theme and Thrust Leaders, who are also members of the RMC, manage inter-project coordination.

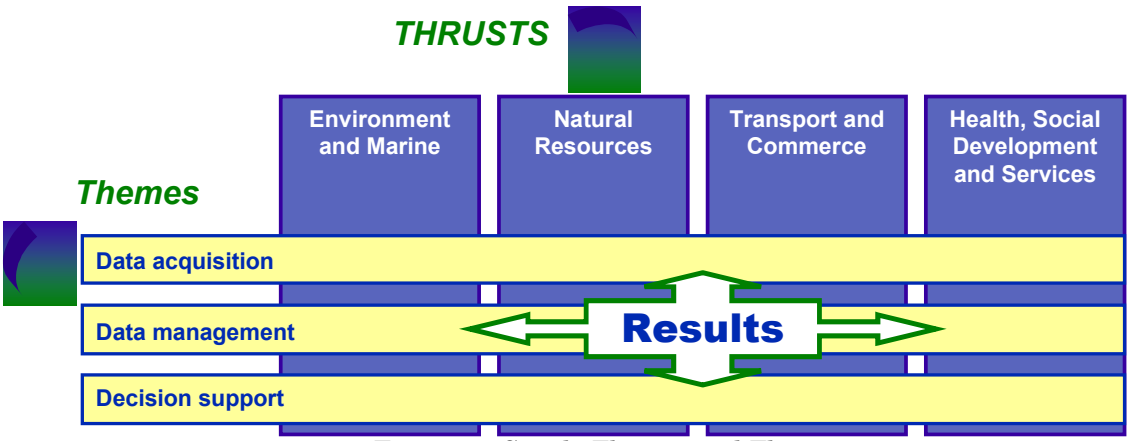

Figure 2: Geoide Themes and Thrusts

GEOIDE has research thrusts that go beyond the traditional Geomatics field to include e-commerce, transportation management, health information science, and delivery of social services (Figure 2). GEOIDE has a total investment budget of about $48 million (1998-2005) that provides researchers with the necessary resources and training required in order to take up the Geomatics challenges ahead (Figure 3).

	NCE	Other contributions	TOTAL
Phase 1 (1998-2002)	12 000 000$	16 800 000$	28 800 000$
Phase 2 (2002-2005)	9 000 000$	11 300 000$	20 300 000$

Figure 3: Funding breakdown and allocation 1998-2005

This financial commitment to research has helped Canada keep its leading scientists and compete with organizations on a worldwide scale. It is important to stress that, while the initial funding has come predominantly from the Federal government (which includes the original NCE contribution), there has been a larger percentage of funding and in-kind support from other sources (Figure 4). The percentages shown in Figure 4 will continue to change as three new private sector companies and at least two other government agencies begin active partnership and increased funding in 2002.

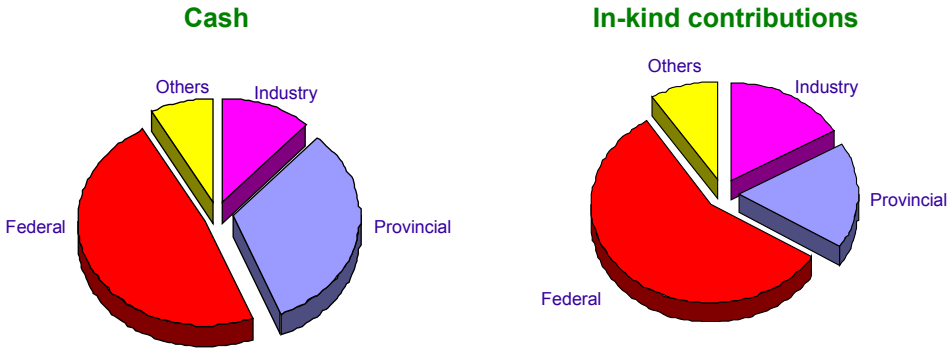

Figure 4 : Contributions to GEOIDE by sector and type

3.1 Partnerships and Leverage

New GEOIDE partners join a network that has matured; thus, they get the benefit of the network without the start-up costs. Network members and participants have already developed a culture and mindset of positive collaboration. This has not been an easy process, given the breadth of the country and the diverse approaches that exist for pursuing research objectives. It has, however, been successful, and new partners and affiliates can join the network and reap the benefits without having experienced the growing pains.

Direct benefits include the following

- Shared cost of research and development with other partners.
- Leverage opportunities within GEOIDE funding umbrella.
- Leverage opportunities with other programs in conjunction with GEOIDE.
- The ability to leverage both commercial interests and academic excellence in a single project.

3.2 Access to Intellectual Property

The most significant benefit for collaboration and partnership with GEOIDE is access to a large pool of intellectual property. Many Canadian private sector companies and government agencies participate as affiliates on projects by

providing data or limited amounts of funding. In return, they receive updates on how this data can be used and potential small specific applications; this is a very limited return on investment, however.

If an organization is a partner in the GEOIDE network, it can access assets across the network and use those network components that address particular issues or problems. As a partner, an agency can target its funding contribution to particular researchers and even develop its own network team to address an issue. As a partner, the agency participates in the GEOIDE Management Board, thereby having input into the overall research investments of the network. As the network expands, full partners' interests are well-represented and the partners contribute to the overall direction of the research.

An added bonus to a private sector partner is access to knowledge of methodologies and technologies at the pre-commercialization phase. Benefits can also accrue to the public sector. Knowledge of the commercialization path can allow a public agency to make better purchasing decisions based on a complete understanding of emerging technologies. In addition, rights to particular intellectual property developed through a funded project can be negotiated such that a contributing partner has access to technology at a reduced cost.

The GEOIDE networking infrastructure can directly benefit any partner. The GEOIDE Business Centre supports research partners through programs to share knowledge, broker partnerships with the private sector, and to coordinate Geomatics advances with other programs such as GeoConnections.

3.3 Access to Highly Qualified Personnel

The training of highly qualified personnel (HQP) is an essential element in developing and maintaining GEOIDE as a permanent self-sufficient network of Geomatics in Canada. There are four goals regarding the training and maintaining of HQP.

- Increase public awareness of the very nature of Geomatics and the abilities held by HQP.
- Ease the penetration of Geomatics and the personnel associated with non-traditional sectors.
- Ensure the existence of tight links between academic, industrial and governmental participants. GEOIDE works with individual organization and groups such as the Geomatics Industry Association of Canada to continually enhance the participation of individuals in the NCE.
- Ensure the continuance of the knowledge base that exists in dispersed agencies and institutions. Canada, like many countries, has a huge number of senior staff in many agencies that will be retiring in 3 to 8 years. Transfer of intellectual property and backfilling of skills will be a significant challenge.

Partners and affiliates benefit from access to world-class researchers and to the entire network of HQPs who participate in GEOIDE. GEOIDE currently has over 300 students in the network that are emerging from the program with skills that map directly to needs that many agencies to address. Many of these talented people are available for term and co-op positions while completing their academic requirements.

4 BENEFITS OF NETWORKING

4.1 Benefits of Networking within a Project

Any network partner can develop a project based on a particular need and take advantage of the expertise across the GEOIDE network. Partners have access to contacts, researchers, and affiliates across the network to define the best possible team to work in a particular area. A partner can sponsor this type of project without waiting for the cycle of proposals, evaluation, and funding associated with non-directed projects. This shortens the time from project inception to completion, and provides a way to clearly identify the targets, evaluation criteria, and benefits of the particular project.

4.2 Benefits of Networking across Projects within GEOIDE

As GEOIDE has matured, it has become evident that there are tremendous synergies possible between the universities, project and sponsoring organizations. Exchange of students between projects, as well as sharing of methodologies and ideas, has resulted in an appreciation that the network is larger than the sum of the parts. There are many ways to benefit from this environment. One obvious means is through collaboration on solving particular problems. The GEOIDE Network currently has several projects involved in coastal zone, Fisheries, and Forestry

research. It is conceivable that these projects have addressed some aspect of a problem currently facing an agency. By participating in the research, an agency can gain access to methods or share the funding of solving a particular problem; both activities can decrease overall costs. GEOIDE also produces intellectual property in the form of software applications, application logic, and commercial software. Rights to this type of intellectual property can be shared between co-developers.

4.3 Networking outside GEOIDE

GEOIDE is only one of many NCEs in Canada; there are networking, partnering, and funding opportunities at other levels that can be exploited. Participants in GEOIDE are encouraged to form ancillary linkages, and may call upon GEOIDE to help develop or enhance their efforts. These linkages can be with other academic initiatives or commercial enterprises, and may involve other national bodies. Several GEOIDE project participants have collaborated with researchers in other countries, including China, Iran, the USA, and France. Some GEOIDE projects have linked to other programs to access skills and showcase capability. An example of this is the TSUNAMI sub-project, which leveraged the synergy between GEOIDE DEC #9, the National Forest Information System work funded by GeoConnections and the Capstone program at Camosun college. GEOIDE encourages the full realization of the networking culture and actively promotes, supports, and helps partners and affiliates to take advantage of these opportunities.

5 DEVELOPING A STRATEGY FOR COLLABORATION

Over the last 5 years it has been demonstrated that an investment in GEOIDE always returns good value. The key for a potential investor or stakeholder is to find the best way to maximize the return on investment. The options for investing are discussed in the following subsections.

5.1 Individual project affiliations

Many public agencies and private sector companies participates in GEOIDE in an opportunistic fashion whereby they contribute small amounts of data, in-kind time or funding to a particular GEOIDE project or sub-project. This type of stakeholder is usually an "affiliate" project member and does not have direct influence on the direction or outcome of the research.

Affiliation in projects is through endorsement, in-kind contribution, and direct funding. Potential return from this type of participation is limited to access to research, Intellectual Property and personnel from the particular project that is being funded. At this level the return on investment is short-term and limited but, the up front cost and overhead for the affiliate is quite small considering the potential returns. Private sector firms can incrementally upgrade products, deploy testbeds, and identify HQP in a low risk environment. Public agencies can develop solutions to specific problems.

5.2 Structured affiliation

As an extension of the affiliate membership in GEOIDE, some stakeholders establish an internal team to evaluate the ongoing benefits of GEOIDE. This team recommends investments in individual project proposals that address issues of interest and then becomes an affiliate member on selected projects. As an affiliate member, the stakeholders interact with GEOIDE at arm's length through the University researcher running each project. Benefits accrue over the long term, albeit in a piecemeal fashion. In this scenario, the stakeholder still has only limited input to influence those projects to which it contributes. Similarly, the stakeholder has access to Intellectual Property and methodologies from only those projects to which it contributes. This type of partnership bears an increased cost of overhead with a small incremental increase on return. Risks are minimized by multiple investments.

5.3 Full Partnership

A full partner in the GEOIDE Network, with a seat on the Management Board has access to all the programmes, outcomes, and benefits from the GEOIDE Network. Benefits include the following.

- Support from the GEOIDE Business Centre to assess, participate in, and access output from the network. This includes developing and supporting the bidding and evaluation of proposals on research themes proposed by partner level organizations.

- Access to GEOIDE programmes that fund scholarships, co-operative work terms, Planning and Design Workshops, and marketing of solutions developed by network participants.
- Leverage the relationships that GEOIDE has with its other partners like the Space Agency, the Canadian Centre for Remote Sensing, and the GeoConnections programme.
- Access to Intellectual Property from ALL GEOIDE projects.
- Access to Highly Qualified Personnel from ALL GEOIDE projects.

In addition, partners in GEOIDE can steer research in chosen directions, propose and fund specific projects, and/or influence the direction of GEOIDE itself. This point is especially timely, since GEOIDE is currently defining its directions and targets for Phase 2 and 3 of the research programme. Anyone partnering now has tremendous influence over upcoming research agendas.

To become a Partner requires a yearly minimum contribution of $100,000 to the GEOIDE network, which can be a mixture of in-kind and cash. Of the yearly contribution, $25,000 is used by GEOIDE to fund scholarships, cooperative programmes, the Student Network, workshops, and the Market Development Fund. The bulk of the partnership contribution can be targeted by the contributing Partner to specific projects, research topics, and/or individual researchers. Components of the scholarship programme, market development, and co-op education fund can also be directed to be used regionally so that specific Universities, Government agencies, and companies get maximum benefit.

6 CONCLUSION

The key steps for a potential network partner is to develop an understanding on the best return on investment. The actual mechanism for establishing the partnership can straightforward and negotiable. Current yearly contributions to individual GEOIDE projects can be counted towards the Partnership cost. In addition, a one-time up-front contribution can be leveraged over multiple years.

Even more important than the return on investment is a commitment to provide solutions to real problems in the real world. GEOIDE has been demonstrated success at a technical level but to achieve the long-term objective of nurturing a sustainable research network more input is needed from the top down. Partners in GEOIDE represent a set of values from stakeholders who have issues that need to be addressed. Therefore, as a partnership is put in place participants must recognize that there is more than monetary investment required. For the partnership to be effective there must be recognition of the responsibility of both partners to provide leadership, direction and to apply the output from the research. The province of Quebec has adopted this approach to participation, whereby the Quebec Ministry of Sustainable Resource Management represents the requirements of the entire province on the GEOIDE board. This means that GEOIDE partners should be willing to participate in:

- Projects definition
- Project development and partnering
- Project undertaking
- Developing leveraged funding models
- Promoting the Application of the outcomes of the research

GEOIDE is about synergy, and that means that a partner can get results only through effective participation. For a partner to reap the full benefit of partnership, the partner must contribute funds, time, and expertise to help direct research.

Conversely, GEOIDE provides leadership and guidance for the development of multi-disciplinary, multi-university, and potentially multi-cultural projects. Canada's universities have a huge untapped and unrealized applied research potential that needs direction. GEOIDE provides brokering services as a network hub to help ensure the effectiveness of projects. This function is being strengthened to develop, promote, and apply these services across the entire research community in Canada. It is in this area that the biggest impact can be realized in the next GEOIDE cycle.

To conclude, GEOIDE is about partnership, progress, personal and team excellence and success. Consider this paper both as information and as an invitation to participate.