

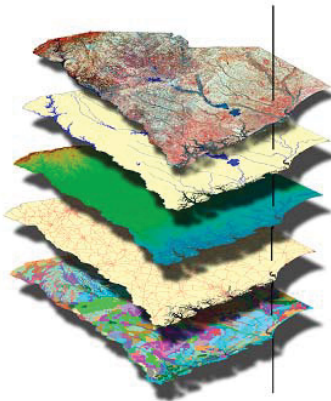
GEOSPATIAL INFORMATION AND THE INFORMATION SOCIETY: A LEADERSHIP ROLE FOR CANADA

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Introduction

The objectives of this presentation were to introduce, to WSIS and members of civil society organizations at the WSIS conference, about the leadership role of Canada in the field of geomatics and geospatial information in all sectors. In addition, to discuss the critical importance of geospatial information for sustainable development, health, culture and community based research. Finally, issues that impede progress were also addressed.

1. What is geospatial information (GI)?



GI is data, usually stored with coordinates, that describe the location, shape and spatial relationships of geographic features, such as: Rivers, Lakes, Coastlines; Political Boundaries; Cities, roads, Land Use; Heritage Sites, Protected Areas, etc. Many of the earth's physical and social issues can be mapped and modeled in both 2D and 3D to provide visual information to inform decision-making on a variety of issues (e.g., diffusion of SARS, Malaria, or the best site to locate a recreation centre).

Framework data are fundamental data sets or base map layers upon which other data can be integrated at a particular scale for a particular jurisdiction. These are the fundamental data sets required for a nation, its agencies and institutions to achieve their objective and responsibilities. These are authoritative and normally produced by National Mapping Agencies. (Lauriault, T. P. (2003), A Geospatial Data Infrastructure is an infrastructure for Sustainable Development in East Timor). Geobase is the program that delivers framework data at no cost to Canadians (<http://www.geobase.ca>).

2. Why is GI important in an information society?

In Knowledge Based Economies (KBE); accessing, integrating and using Geospatial Information (GI) from disparate sources guides decision-making on a variety of issues: transportation; urban planning; security; resource management; health and sustainable development, to name a few.

Democracy and government accountability rely on informed citizens and civil society organizations, GI and its analysis enables educated engagement. (For additional information on GI and democracy see: *Community Mapping and New Possibilities for Democracy* (2003), by Tracey P. Lauriault and David Welch in *Canadian Review of Social Polity*, Winter 2003 #52.)

GIS-Based Decision-Support Systems allow a decision-maker to: 1. build relationships, both spatial and process-based, between different types of data; 2. merge multiple data layers into synthetic information; 3. weigh outcomes from potentially competing alternatives, and 4. forecast. To do this, a spatial decision-support system use requires: data; known relationships between data, and analysis functions and models to synthesize relationships or to test scenarios of different policy or decision-making alternatives (Down to Earth Report www.nap.edu – search for “Down to Earth”).

3. Canada's Achievements

a) Canadian Geospatial Data Infrastructure (CGDI) – Geospatial Data Infrastructures (GDIs) are the institutions, policies, technologies, processes, standards and framework data that direct the who, how, what and why geospatial data are collected, stored, manipulated, analyzed, transformed and shared. They are multidimensional, intersectoral, cross-domain, interdepartmental requiring regional, national and sub state consensus building. In terms of data GDIs include cultural, social, scientific, economic and historical data to name a few (Lauriault, T. P. (2003), *A Geospatial Data Infrastructure is an Infrastructure for Sustainable Development in East Timor*). GDIs now exist at the global, regional national and sub-state scales. It is suggested that civil society be more engaged with GDI and that overseas development agencies integrated their data within them.

The CGDI provides infrastructure tools and services for the discovery of, and access to, geospatial products and services, to serve a wide range of Canadian stakeholders (<http://www.geoconnections.org/CGDI.cfm>). Some of the programs available to Canadians via the CGDI are:

- 1 *Discovery Portal* – enables finding and access to GI (<http://www.geoconnections.org/CGDI.cfm/fuseaction/cgdiServices.welcome/gcs.cfm>). The Discovery Portal is the prime discovery and access component of the Canadian Geospatial Data Infrastructure (CGDI). Tools and services are developed in close co-operation with CGDI Stakeholders. In the case of Canada, data providers register their data into the portal's catalogue. The catalogue can be searched on a variety of topics. Available data sets are returned as search hits, some data are for sale and others are available at no cost to the user. The key word for the search in this slide was Human Effects on the Environment. The available data on the Portal related to this topic are transportation, ecosystem maps, air quality data and etc.
- 2 *Geobase* – enables the integration of Geospatial Information (<http://www.geobase.ca/>)

b) The Data Liberation Initiative (DLI)

The Data Liberation Initiative (DLI) is a Data Consortium between Statistics Canada and 66 Post Secondary Institutions in Canada that provide data at no cost for non-commercial academic purposes (<http://www.statcan.ca/english/Dli/whatisdli.htm>). Prior to the DLI, Canadian universities, colleges and students purchased Statistics Canada data, file by file. Students thus conducted research with data from the US as the cost of Canadian data was

prohibitive. With the advent of the DLI, participating post secondary institutions pay an annual subscription fee that allows their faculty and students unlimited access to numerous Statistics Canada public use microdata, databases and geographic files. Academic researchers now have affordable and equitable access to the most current statistics and other data, which gives them powerful tools to use in their analysis of Canadian society.

Today, civil society organizations, municipalities, provincial governments, federal departments and the general public have to purchase data, which is very expensive. It is argued that a knowledge-based economy requires that data be available at no cost for non-commercial purposes to enable a non-partisan analysis of Canadian culture, society and environment (e.g., homelessness, health determinants of poverty, nuclear waste disposal sites, etc.). At the moment, Canadians pay for this state collected data at a minimum of three times, once with their taxes, again when government and health agencies purchase it for their work, and thirdly when they purchase it themselves. Cost recovery policies impede access to data and knowledge in Canada. The DLI is a cost effective method model that can be extended to the public library, National Library and Archives, high schools and related infrastructures to make data available to civil society organizations and the general public for non-commercial purposes.

The DLI is a partnership between Statistics Canada and participating Canadian post secondary institutions:

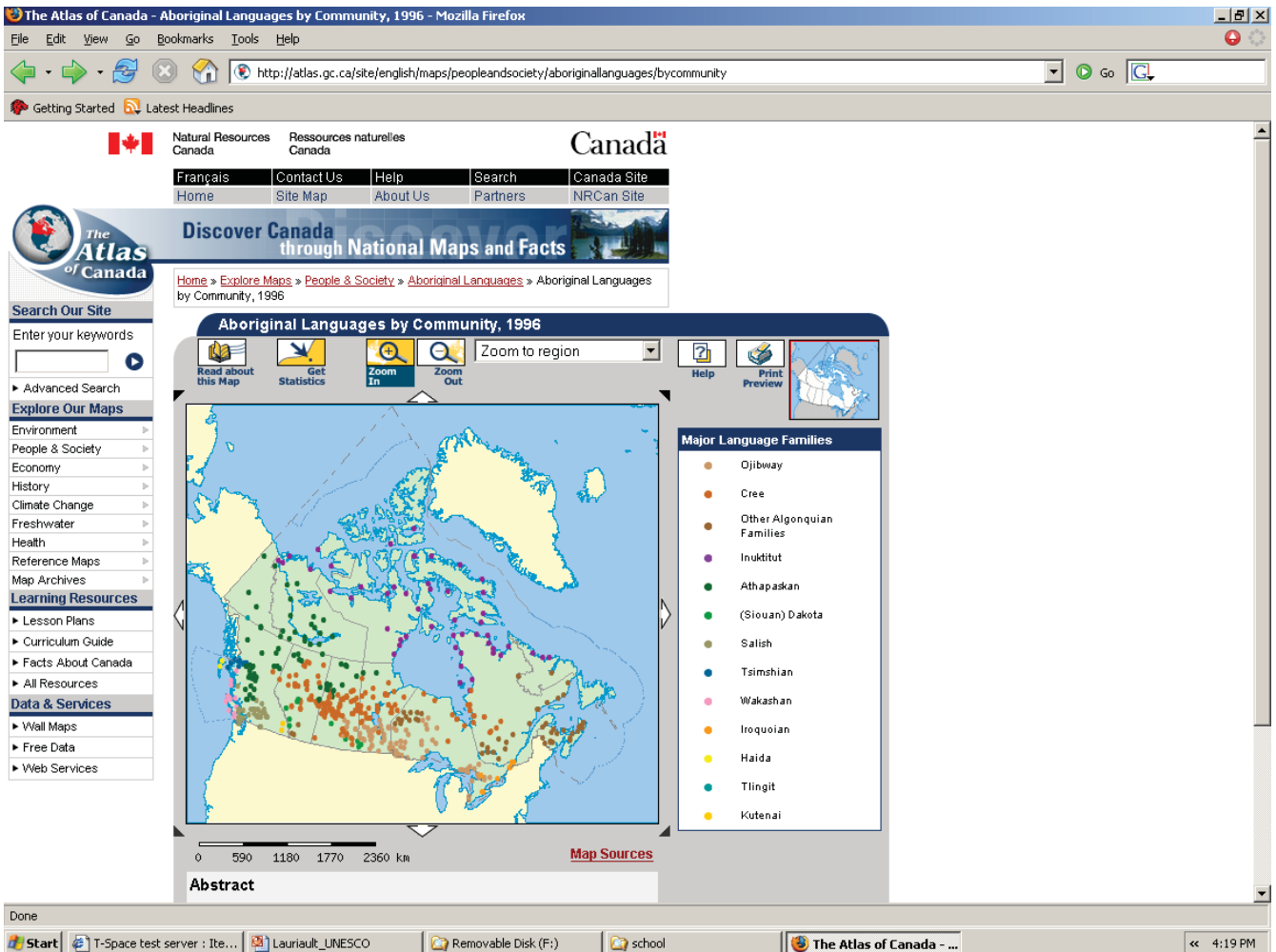
- 1 There are 66 participating institutions.
- 2 Data are made available on a subscription basis.
- 3 All member institutions must sign a data use license agreement when joining the project.
- 4 Under this license data are made available for:
 - o Teaching,
 - o Planning of academic/educational services,
 - o Academic Research and Publishing.
- 5 Data are not to be used in any commercial or private activities.
- 6 These data are digitally encoded and stored in a file structure. These include:
 - o Public Use Micro Data Files (PUMFs), Census/Geography Files, Databases, Metadata and software are needed to read and understand the data
 - o Main focus of DLI Collection is on Socio-Economic data.:
 - o Health, Education, Literacy, Labour Market, Income, Travel, Justice, Census, Demographic Etc.

(Extracted from a Presentation by: Mike Sivyer, DLI Products, Services and License.)

4. Communicating Geospatial Information (GI) to Canadians

a) *The Atlas of Canada*

The Atlas of Canada communicates the spatial distribution of important issues of Canadians. The Atlas of Canada is the Canadian Geospatial Data Infrastructure (CGDI) program that enables Canadians to visualize GI (<http://atlas.gc.ca/site/index.html>). The Atlas delivers hundreds of maps on a variety of topics, such as: Human Activities Leading to Emissions, which are related to the Kyoto Protocol; the Economy, Health, and etc. Education modules are also available on these and other topics.



The above map depicts aboriginal languages by communities in Canada in 1996. Understanding the distribution of languages informs planning for those communities and also enables users to picture the distribution of a unique aspect of Canada's social, economic and cultural heritage.

b) The Cybercartography and the New Economy Project (<http://gcrs.carleton.ca>)

Cybercartography reflects the changing nature of cartography namely: the organization, presentation, analysis and communication of spatially-referenced information on a wide variety of topics, of interest and use to society in an interactive, dynamic, multidisciplinary, multisensory format, with the use of multimedia and multimodal interfaces (D. R. Fraser Taylor, 1997, keynote address entitled *Maps and Mapping in the Information Era* International Cartographic Conference in Sweden). A key point is that Cybercartography is a theoretical construct and not a product. Elements of cybercartography define a new form of cartography and unlike GIS software; you cannot buy a cybercartographic system. The construct requires people and research as primary elements.

The seven elements of cybercartography are: multimedia, multisensory, multimodality, interactivity, applied to a wide range of topics, new partnerships, new ICTs (e.g., open source), and collaboration.

The project Aims to create two innovative products and methodologies to complement

discovering, utilizing, presenting and distributing existing information and data. The project will deliver: The Cybercartographic Atlas of Antarctica; The Atlas of Canada's Trade with the World; Proof of concept products and prototypes; Research Publications; a Transdisciplinary Approach to Research with Intended users being scientists, decision makers and the general public – Focus on Students & Teachers.

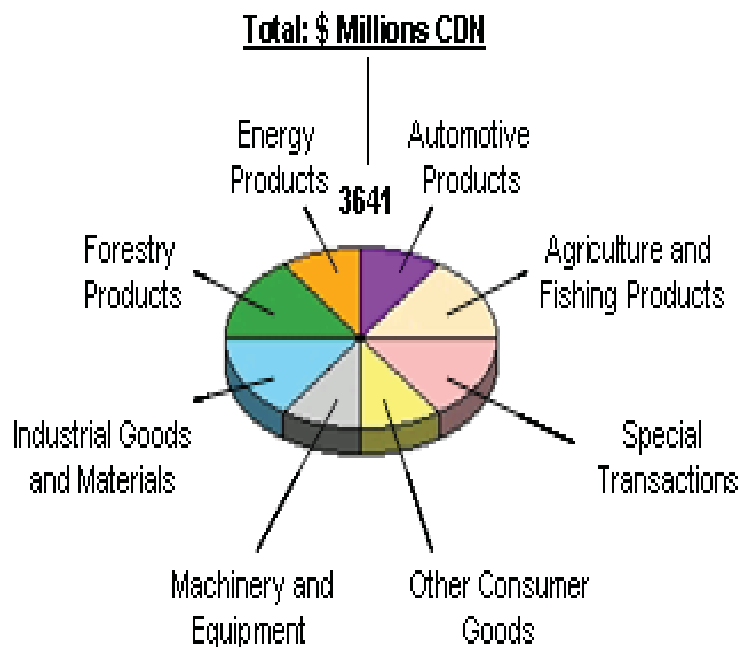
This R&D project is funded by: Social Sciences and Humanities Research Council of Canada (SSHRC) Innovation on the New Economy: Collaborative Research Initiatives (http://www.sshrc.ca/web/apply/background/ine_about_e.asp) on Nov. 2002, a 4-year grant of C\$2.56 Million was awarded to research Cybercartographic theory and practice, and the project formally started 01/2003 PI – Dr. D.R. Fraser Taylor, Chancellor's Professor and Director of the Geomatics and Cartographic Research Centre.

1 *The Cybercartographic Atlas of Canada's Trade with the World (CTW)*

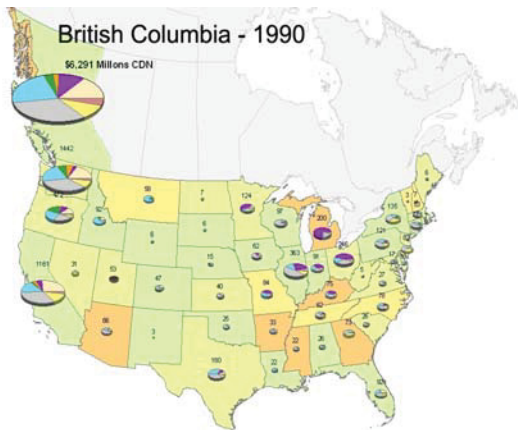
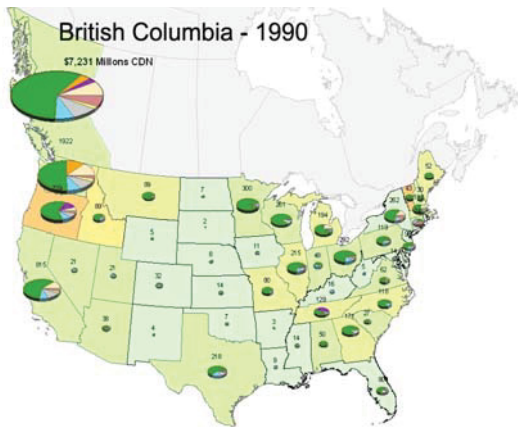
The CTW is part of the Cybercartography and the New Economy (<http://gcr.carleton.ca>). Canada depends on Trade for its economic and social sustainability. The CTW aims to provide a rich assortment of trade information in the form of maps, graphs, and tables within a series of chapters that will illustrate how trade works, special case studies, and especially why trade is important to national and global issues. The focus is to provide information about Canada's history as a global trading partner with many industrialized and developing nations, as well as focus on current and future trends in trade. The data are at three nested scales, Canada and the World, the Continent of America, and with the US.

The primary target user base for the CTW is for educational purposes at the high school and university level, it is anticipated that this atlas will also serve the general public and some policy analysis. The CTW is being built with the use of open source mapping technologies and interoperability standards.

The CTW Atlas will be hosted as part of the Atlas of Canada. Trade data and statistics are provided by International Trade Division (ITD) at Statistics Canada.



Ten Year Change (%)*



The above image is a prototype example of provincial patterns of trade with the USd.

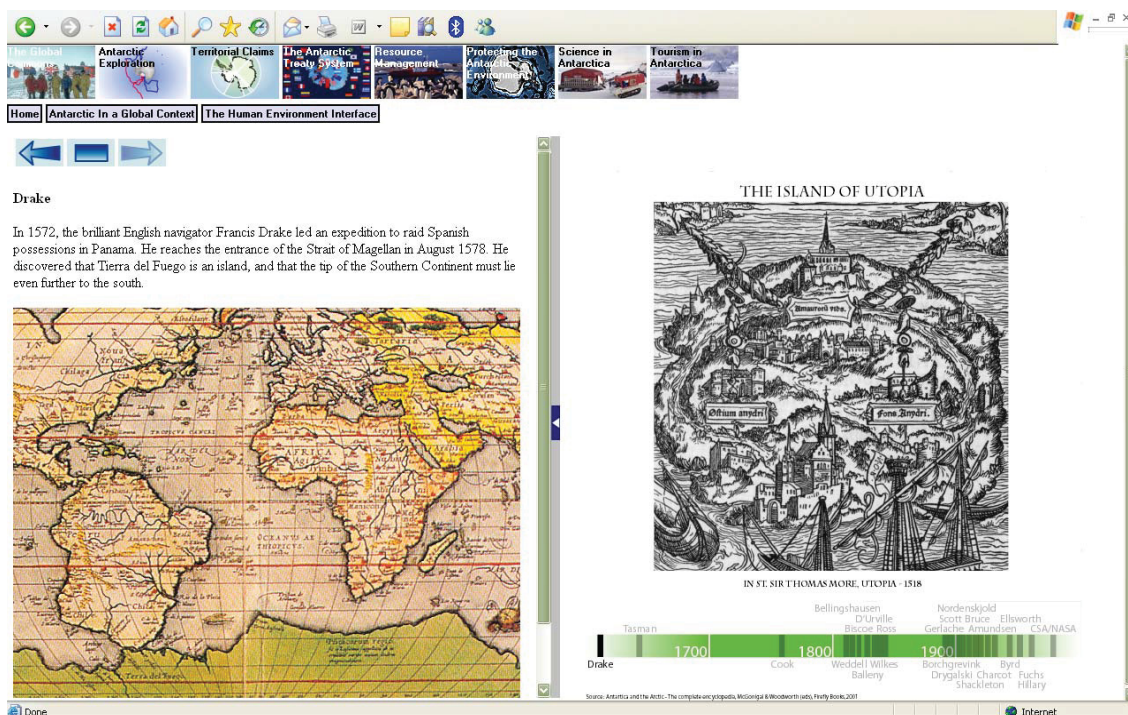
The Trade Atlas Content Development team: Lead – Brian Eddy, Dale Powell, Ilka Guttler, Oksana Pidafula, Charlene Yousf, Darek Ciach, Ken Pawlil, Francis MacDonnell, with User Interface Design and User Needs Analysis being conducted by the Human Oriented Technology Laboratory (HOTLab) (<http://www.carleton.ca/hotlab/index.html>).

2 The Cybercartographic Atlas of Antarctica

The Cybercartographic Atlas of Antarctica Project (<http://www.carleton.ca/gcrc/caap/>) aims to develop an on-line atlas portraying, exploring and communicating the complexities of the Antarctic continent for education, research and policy purposes. The atlas will highlight the global importance of Antarctica as the continent of science and peace.

Data from a number of international sources will be incorporated into the atlas. In collaboration with experts from different fields of science, these data will be used to develop theme specific modules for use by the general public and policy makers and to facilitate knowledge sharing in multi-disciplinary science.

A number of modules are underdevelopment: Exploration; Territorial Claims; Treaty System; Resource Management; Protecting the Antarctic Environment; Science in Antarctica; and Tourism in Antarctica.



The above module on exploration was designed by Sebastien Caquard and Peter Pulsifer.

The Atlas Content Development team:

Lead – Peter Pulsifer, Birgit Woods, Sebastien Caquard, Xiuxia Liu, Yuchai Zhou, Amos Hayes, JP Fiset, Avi Parush, with User Interface Design and User Needs Analysis - Human Oriented Technology Laboratory (HOTLab) (<http://www.carleton.ca/hotlab/index.html>).

5. Canada's Leadership Role in Cutting Edge Research

Canada's funding Councils are a potential model for other countries and need to be more widely appreciated in Canada. These fund research of relevance to Canadian society and industry as well as international issues. The agency & projects highlighted for the context of this conference are:

3 Social Sciences and Humanities Research Council of Canada (SSHRC)

SSHRC (http://www.sshrc.ca/web/home_e.asp) is an arm's-length federal agency that promotes and supports university-based research and training in the social sciences and humanities. Created by an act of Parliament in 1977, SSHRC is governed by a 22-member Council that reports to Parliament through the Minister of Industry.

SSHRC funded research fuels innovative thinking about real life issues, including the economy, education, health care, the environment, immigration, globalization, language, ethics, peace, security, human rights, law, poverty, mass communication, politics, literature, addiction, pop culture, sexuality, religion, Aboriginal rights, the past, our future. See:

- o Initiative on the New Economy (INE)
- o Major Collaborative Research Initiative (MCRI)
- o Strategic Research Grants (SRG)

4 Projects of relevance in this context:

- o Cybercartography and the New Economy (<http://gcr.c.carleton.ca>)
- o International Research on Permanent Authentic Records in Electronic Systems (InterPARES 2) (<http://www.interpares.org/>)

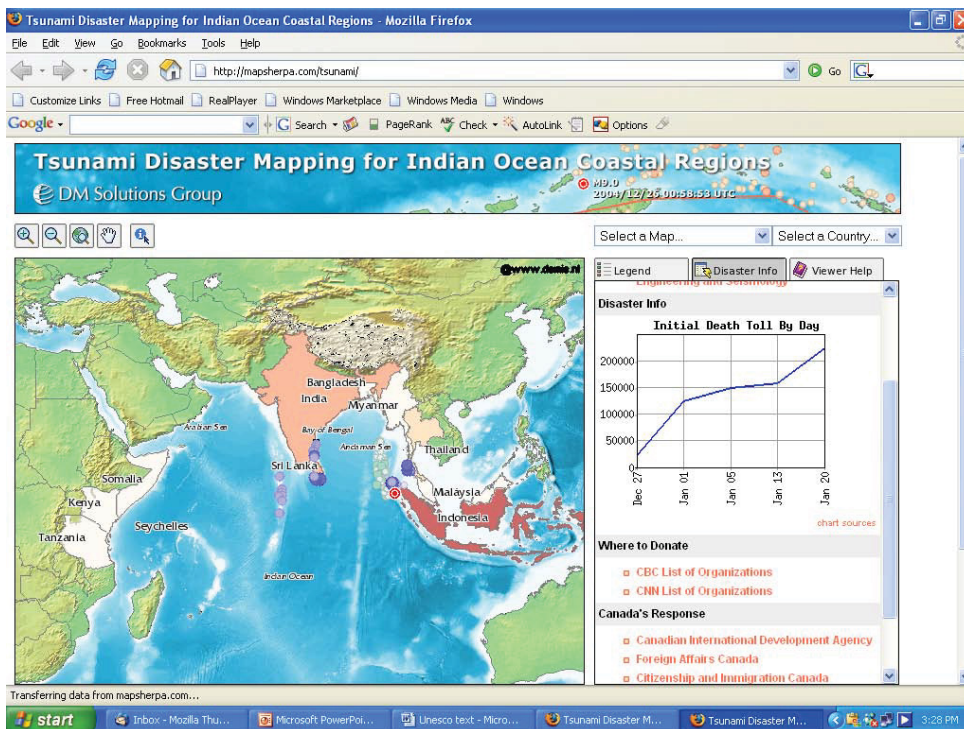
6. Industry – Open Source Mapping

Open source mapping is a growing geomatics sector in Canada. The technology has come along way. The Atlas of Canada uses open source technologies and as previously discussed both the Cybercartographic Atlases will be built in open source wherever possible. The objective is to develop tools to enable easy content creation, viewed on open source browsers and with archiving in mind. In addition they will use Open Geospatial Consortium interoperability standards and ISO.

A leading company in Canada is The DM Solutions Group (<http://www.dmsolutions.ca/solutions/tsunami.html>) who conduct all of web-mapping business using, developing and promoting open source technologies. DM Solutions Group Inc. is the world's leading provider of open source Web and desktop mapping solutions and the industry leader in the development of open source mapping technology. The team at DM Solutions Group works with organizations striving to achieve a professional look and feel with custom Web mapping solutions. This is primarily accomplished by adopting and developing MapServer, a leading open source Web mapping product. DM Solutions is responsible for the addition of many key enhancements since 2000, and has become the world's largest contributor to MapServer.

They are the largest such geomatics company in the world. They have work with: Health Canada, Environment Canada, Natural Resources Canada, Lignum Forestry, The Atlas of Canada, GCRC, GeoConnections, CIET International, Refractions Research, and GeoSoft, to name a few.

One of their latest contributions was the Tsunami Mapping project (<http://www.dmsolutions.ca/solutions/tsunami.html>).



7. GI and Civil Society

Currently few civil society organizations in Canada work with geospatial information as the cost for data, technology and human resources is very prohibitive, as previously discussed. The environmental movement in Canada has made some important contributions as has the Social Planning Network of Ontario (SPNO) (<http://www.spno.ca/projects.html>) with its Social Data Consortium.

1 Social Planning Network of Ontario Social Data Consortium –

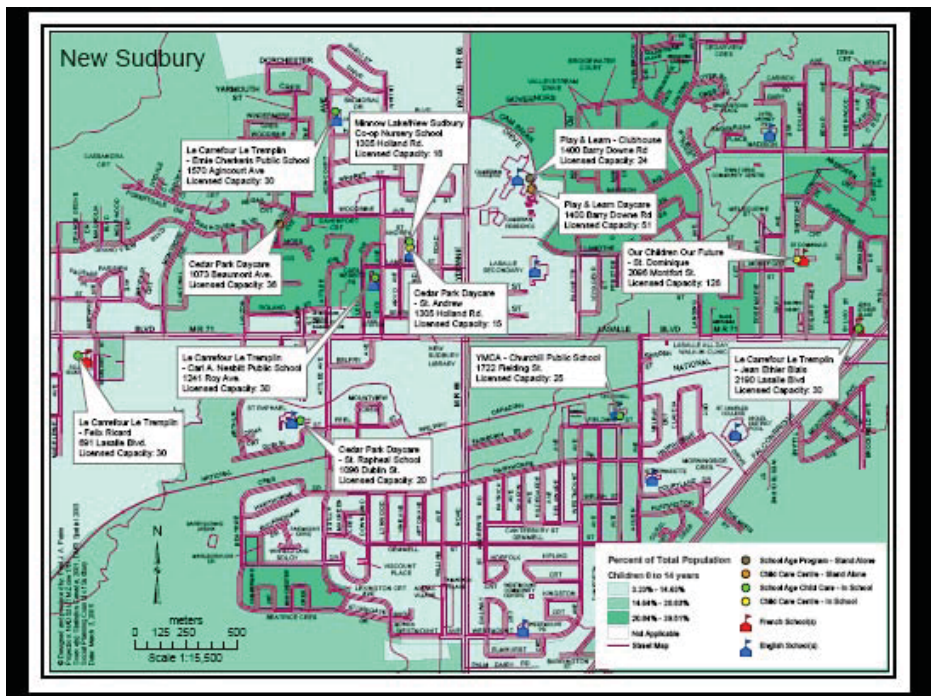
The Consortium has 15 member social and community development organizations in Ontario under the leadership of Community Development Halton (CDH). The Consortium has purchased computer equipment, GIS software, and data (Census, street/boundary files...). In addition they have retained a training coordinator to assist all the members. Each of the individual organizations has its own mandates but is connected in the cause of effecting change on social policies, conditions, and issues.

The Consortium: “provides members with capacity in spatial analysis and research to build and strengthen communities”. The Social Data Consortium Progress to date:

1. All members received GIS training.
2. Increased awareness of potential GIS applications.
3. Majority members are using GIS in their work and some are seeking new “business” opportunities.
4. Ongoing delivery of GIS workshops and development of resource materials.

Members are sharing their mapping experiences and lessons learned and examples are:

- 1 Conduct needs assessments of service delivery plans of community legal services;
- 2 Identify needed health care services of the “Out of the Cold” programs;
- 3 Support “Incomes and Poverty” reports;
- 4 Compare food bank points of service with low income area;
- 5 Planning for branch library development.



Challenges:

- 1 Variation in GIS competence among members;
- 2 More cartographic training to produce “meaningful” maps;
- 3 Many members lack dedicated GIS staff;
- 4 Turnover of trained GIS staff;
- 5 Cost to acquire customized Census data prohibitive.

Opportunities:

- 1 Continue to gain acceptance and support from members’ clients by demonstrating the benefits of GIS in providing answers to social questions of importance;
- 2 Market GIS to other social service providers/ agencies as well as potential funders;
- 3 Facilitate broad community access to data and mapping capacity;
- 4 Build strong business case to acquire more powerful GIS software (e.g. Spatial Analyst, Network Analyst).

For additional Information: Please contact: Ted Hildebrandt, Senior Social Planner, Community Development Halton, thildebrandt@cdhalton.ca, Web: www.cdhalton.ca, www.volunteerhalton.ca.

8. Challenges for an Information Society

1 Data Accessibility:

- o Cost Recovery impedes access to data for Civil Society organizations and the general public (e.g., Statistics Canada);
- o The DLI only includes Universities (not schools, or Non for Profit Organizations, public libraries and archives).

2 Scale:

- o Framework data are national scale only; there are currently very few publicly available provincial, city, municipal and rural area framework data sets.
- o Need cost free provincial, city and community scale social, cultural, heritage, health, economic, and environmental data.

3 Cost:

- o Software, data and Human Resources are expensive.

4 Research Funding:

- o Funding for Non-Government Organizations (NGOs)/civil society organizations to use geospatial information for research (e.g., social planning, community mapping, environmental groups, critical globalization, gender, culture, etc.) is scarce. Few funding agencies comprehend the need and benefits for data acquisition and use for social sector organizations, let alone the use of geospatial information.
- o NGO funding in Canada comes primarily from government and very little core organizational funding is available for advocacy research. In addition, taking a critical stance against one's funding agency is not always promoted nor welcome.
- o NGO funding also comes from gambling institutions such as the Trillium foundations, however, taking resources from an agency that supports a social problem to resolve another has serious ethical implications. Further, research on topics related to gambling are discouraged under this scheme.
- o Research funding primarily goes to universities and very little to NGOS although the CURA (Community-University Research Association – http://www.sshrc.ca/web/apply/background/cura2001_backgrounder_e.pdf) funded by SSHRC is a good start.

5 Archiving:

- o Canada does not have a Digital Data Archive, a Science Data Archives, nor is Canada Funded Research archived. This means that we may not have access to the information and raw data we have created and collected in the last few decades nor the information and raw data we are currently creating and collecting. This is a serious knowledge based economy and information society gap that needs to be further investigated.