

Collaborative Geomatics and the Mississaugas of the New Credit First Nation: Triaging Requests for Planning Development Consultation

Daniel D. McCarthy, University of Waterloo, Canada
Graham Whitelaw, Queen's University, Canada
Carolyn King, Mississaugas of the New Credit First Nation, Canada
Clynt King, Mississaugas of the New Credit First Nation, Canada
Leela Viswanathan, Queen's University, Canada
Don Cowan, University of Waterloo, Canada
Fred McGarry, Centre for Community Mapping, Canada
Scott Anderson, University of Waterloo, Canada

Abstract: Collaborative geomatics systems are web-based tools that support a common reference map based on high resolution imagery. These tools allow communities to collect, store, and present dynamic geo-referenced information (i.e., oral, written, visual). By employing the Web Informatics Development Environment (WIDE) toolkit, these systems require less technical expertise to maintain, allow for prompt customizations, are relatively inexpensive and user-friendly. These collaborative information infrastructures incorporate concepts similar to participatory geographical information systems. This paper describes the early implementation of a "collaborative geomatics" system, which is a potential innovation in place-based information and knowledge sharing for fostering the capacity of First Nations communities. Collaborative geomatics may enhance the capacity of First Nations to develop "community-based constraint mapping" of Traditional Territories including the capture and use of traditional environmental knowledge (TEK) in a structured but culturally-sensitive manner. The tool will enable First Nations communities to manage and triage requests for consultation associated with development proposals within their Traditional Territories. A case study of the Mississaugas of the New Credit First Nation (MNCFN), who are subject to numerous treaties and who have recently settled a specific land claim, is utilized to demonstrate the potential utility of a collaborative geomatics system to manage and triage the high-volume of consultation requests.

Keywords: Collaborative Geomatics, Canadian First Nations, Environmental Assessment and Land Use, Planning

Introduction

A number of key Supreme Court decisions, dealing with resource and land management over the past 20 years, have changed the relationship of Canadian First Nations with both governments and private resource developers (Asch and Macklem, 1991; Lawrence and Macklem, 2000; Isaac, 2003). These decisions are beginning to clarify the implications of constitutionally-protected Aboriginal rights, and fiduciary duties owed by the Crown, including the duty of the Crown to consult and accommodate Aboriginal communities with respect to activities that may impact the exercise of Aboriginal rights on Traditional Territories (Asch and Macklem, 1991; Lawrence and Macklem, 2000; Isaac, 2003). Aboriginal Traditional Territories in Canada, generally include Federal Reserves as well as lands surrendered through Treaty processes. These lands may be Provincial Crown or privately held lands.

There is a broad spectrum of interpretations of the requirements for the Crown's duty to consult in Canada depending on two key factors: 1) the seriousness of potential impact on right asserted; and, 2) the strength of the claim to asserted right (Asch and Macklem, 1991; Lawrence and Macklem, 2000; Isaac, 2003). In Ontario, the outcome of the duty to consult primarily involves the circulation of development proposals to First Nations who would be impacted by proposed development (Government of Ontario, 2006). The majority of development in Ontario is governed by land use planning and environmental assessment legislation (Government of

Ontario, 2012a; 2012b). These policies have detailed circulation requirements. The duty to consult now requires the Crown, or delegated Provincial or private sector development entities, to consult with impacted First Nations. As a result, in regions of high development pressures, First Nations are often inundated with requests to review, and to be consulted, on land use planning and environmental assessment development proposals.

This paper describes the early implementation of a “collaborative geomatics” system, which is a potential innovation in place-based information and knowledge sharing for fostering the capacity of First Nations communities (McCarthy et al., 2011). Collaborative geomatics may enhance the capacity of First Nations to develop “community-based constraint mapping” of Traditional Territories including the capture and use of traditional environmental knowledge (TEK) in a structured but culturally-sensitive manner. The tool will enable First Nations communities to manage and triage requests for consultation associated with development proposals within their Traditional Territories. A case study of the Mississaugas of the New Credit First Nation (MNCFN), who are subject to numerous Treaties and who have recently settled a specific land claim, is utilized to demonstrate the potential utility of a collaborative geomatics system to manage and triage the high-volume of consultation requests.

Our paper first provides some background describing the conditions that impact the capacity of First Nations in Canada to effectively participate in consultation and development processes. These land use and environmental assessment processes are then described. We then outline the concept and application of collaborative geomatics and its potential use by First Nations as a capacity enhancement tool. Through the use of a case study of the Mississaugas of the New Credit we demonstrate the utility of a collaborative geomatics system to address development pressures in their Traditional Territories. Finally we conclude with recommendations for collaborative research in order to further investigate the impact of our findings on future efforts to build more just relations between the state and First Nations in planning and development.

First Nations, the ‘Duty to Consult’, and Planning Processes in Canada

Canada continues to be challenged by colonial interests of the past and present that have marginalized the nation’s Aboriginal Peoples (i.e., First Nations, Metis, and Inuit Peoples). First Nations’ capacity to engage in determining the nature and extent of development on their Traditional Territories is limited by socio-economic conditions that fall below average Canadian levels of employment, family income, education, housing, and life-expectancies. First Nations also experience higher rates of incarceration, substance abuse, and deaths related to violence and suicide. For instance, the Aboriginal employment rate is 14.8%, compared with 6.6% nationally. Aboriginal Canadians earned an average of \$23,888 per year in 2006, compared with \$35,872 for non-Aboriginal Canadians. Aboriginal children living on reserves receive, on average, approximately 22% less in terms of social assistance than non-Aboriginal children. Aboriginal Peoples are four times as likely to live in crowded dwellings (more than one person per room) as non-Aboriginal Canadians and Aboriginal children are eight times as likely to be taken into protective care than their non-Aboriginal counterparts. Collectively, Aboriginal Canadians are twice as likely to live in poverty than non-Aboriginal Canadians (Statistics Canada, Census 2006). These multiple structural social and economic conditions reflect the ongoing colonization and resultant marginalization of Aboriginal Peoples in Canada. These conditions prevent First Nations communities from making strides for sovereignty/self-governance and maintaining their culture, language, traditional/spiritual practices.

Despite the current conditions affecting the status of Aboriginal Peoples in Canada, as previously mentioned, there are key Supreme Court decisions that have set significant precedents potentially giving Aboriginal People’s more involvement in land use development within their Traditional Territories. The duty of the Crown to consult Aboriginal Peoples arises when governmental actions infringe upon existing aboriginal or treaty rights (Asch and Macklem,

1991; Lawrence and Macklem, 2000; Isaac, 2003; Newman, 2010). The Supreme Court of Canada in *Sparrow*, and *Delgamuukw* articulated the Crown's duty to consult Aboriginal Peoples (Isaac and Knox, 2004) and the duty was further elaborated in the *Taku River Tlingit First Nation* case and *Mikisew Cree First Nation* case (Newman, 2010). There is a broad spectrum of interpretations of the content of the duty and the nature of consultation (Isaac and Knox, 2004).

The Crown's duty (i.e., represented by federal and at times, provincial governments) has opened important new possibilities for fostering new relationships among governments, private sector developers and Aboriginal communities. The duty has created a new context for more widespread and extensive interaction between governments, private sector stakeholders and Aboriginal communities, rather than the more limited formal, specific negotiations that had been encouraged in prior case law. The development of the duty to consult doctrine also makes it much more likely that governments, private sector stakeholders, and Aboriginal communities will begin to come to terms with significant issues that have thus far not been subjected to full discussion, such as revenue sharing (Asch and Macklem, 1991; Lawrence and Macklem, 2000; Isaac, 2003; Newman, 2010).

The majority of development projects in Canada, whether undertaken by the public or private sector, are regulated through legislation that deals with environmental assessment and / or land use planning. Environmental assessment legislation exists at the federal level, known as the Canadian Environmental Assessment Act (CEAA) (Government of Canada, 2012) and at the provincial and territorial levels (e.g. Ontario Environmental Assessment Act) (Government of Ontario, 2012b). Examples of development covered by environmental assessment include: mines; energy projects; transportation projects; forestry. Land use planning is the responsibility of provincial governments. In Ontario land use planning is governed by the Planning Act (Government of Ontario, 2012a). Examples of land use development activities include: sub-division/residential, and industrial/commercial developments.

Both environmental assessment and land use planning legislation across Canada require consultation processes. These processes are clearly identified in legislation/regulations and associated guidelines. Common consultation approaches include circulation, open houses, advisory committees, municipal council meetings, community and formal hearings. In accordance with duty to consult requirements with First Nations, governments and proponents of development have included First Nations in these processes. These consultation opportunities may also result in urban First Nations being inundated with requests for consultation.

Collaborative Geomatics and First Nation Communities

Geographic Information Systems (GIS) have been defined as, "an organised collection of specific computer hardware, software, geographic data and personnel designed to efficiently capture, store, update, manipulate, analyse and display all forms of geographically referenced information (e.g. raster/vector) that can be drawn from different sources" (European Commission, 2000). An emerging field - often referred to as Public Participation or Participatory P(P)GIS (e.g., Schlossberg and Shuford, 2005; Jankowski et al., 2006; Sieber, 2006) and neogeography (Turner, 2006; Haklay et al., 2008) to name a few - incorporates a set of techniques, technologies and tools that complement conventional GIS and describe wider, more distributed use and development of geographic data, information and knowledge (Haklay et al., 2008; Taylor 2006; Sieber, 2006).

There is no commonly used definition of PPGIS and use of the term varies considerably (Schlossberg and Shuford, 2005). Generally PPGIS, "pertains to the use of geographic information systems (GIS) to broaden public involvement in policymaking as well as to the value of GIS to promote the goals of nongovernmental organizations, grassroots groups, and community-based organizations" (Sieber, 2006: 491). One can identify multiple "publics" (geographic, economic, professional, social and political) and that these publics can change over

time (Schlossberg and Shuford, 2005). In addition, there are different reasons why these groups participate (Schlossberg and Shuford, 2005). For instance, the concept of “empowerment” is associated with PPGIS (Sieber, 2006). Indeed, PPGIS is meant to enhance the autonomy and self-reliance in spatial data management of a community and promote participatory democracy (Friedmann, 1992).

There is a growing suite of terminology associated with the various techniques tools and approaches that fall within the realm of neogeography or PPGIS, examples include:

- Geoweb - Elwood, 2010;
- Neogeography - Turner, 2006;
- Cybercartography - Taylor, 1993; 2003; Taylor and Pyne, 2009;
- VGI - Volunteered Geographic Information - Goodchild, 2007;
- GIS 2.0 - McHaffie, 2008;
- 'wikification' of GIS - Sui, 2008;
- Web Mapping 2.0; and,
- Web Mapping - Haklay et al., 2008).

Our purpose is not to provide a comprehensive or exhaustive list for such terms (for such a review please see Haklay et al 2008; Sieber, 2006), but to acknowledge that different approaches to geomatics, that are collaborative in intent and implementation, do exist. We have adopted the term “collaborative geomatics”, originally coined in Coleman and Li (1999) where they refer to an unpublished report by Finley (1997) where it is defined by seven key requirements: file management, communications, group discussion, calendaring and scheduling, viewing, administration and security issues. We define collaborative geomatics as a participatory approach to both the development and use of online, distributed-authority, geomatics applications. What makes our collaborative geomatics system unique is the declarative application engine upon which it is based, referred to as the Web Informatics Development Environment (WIDE) (McCarthy et al., 2012).

The Computer Systems Group of the University of Waterloo and its not-for-profit research partner, the Centre for Community Mapping (COMAP) have developed the WIDE toolkit to begin to avoid “gate keepers”, such as, programmers and GIS technicians, thus allowing citizens to take control of some of their own data, information and knowledge, collection, processing and management. In the WIDE context, “programming” has effectively been replaced with a declarative methodology; thus, making it possible to provide a wizard or forms-based approach to building web-based systems. This approach allows the technical team to develop web-based information systems faster than more traditional methods. The WIDE application engine provides the opportunity to use an iterative and collaborative approach to create complex web-based systems where the users are engaged during the entire specification, design and implementation cycle. Once users operate a version of the system, they may quickly refine the specification and the corresponding design and implementation. This method contrasts with the conventional waterfall model of software design where specifications are gathered and then realized without much subsequent input from the user or client. The WIDE, iterative approach to software development allows the technical team to create systems about 10 times faster than more traditional methods. Current research at the Computer Systems Group / COMAP, is intended to create a stand-alone WIDE toolkit to allow communities of practice to create their own applications (McCarthy et al., 2012).

The current WIDE toolkit allows for the following: supports the capture, manipulation and presentation of geo-spatial data; allows interconnection with existing geo-spatial repositories including GIS; supports secure collaboration within social networks and communities; allows applications to be constructed quickly and maintained with minimal expertise; works with standard web browsers, requires no installation as it is provided as a software service over the

Internet and is relatively inexpensive; and supports existing and evolving geomatics standards. The WIDE toolkit supports a common reference map base (typically, high-resolution satellite and aerial imagery, similar to how Google Earth presents data) built upon existing geo-spatial information sources such as government or Google maps; while allowing the entry (real-time) of new geospatial information (spatial features with attribute oral, written or visual media and wiki-narratives – similar to Wikipedia services, but more advanced with safeguards concerning identity and authority), and the analysis and presentation of the results. The WIDE toolkit and collaborative geomatics system is a proven technology having been used in governmental, environmental, population health, non-government, socio-economic and cultural heritage applications (McCarthy et al., 2012).

There are several key concerns that must be examined when implementing collaborative geomatics systems among First Nations communities; these concerns relate to: (1) sustainability in accessing the data; (2) versatility in the systems' application; and (3) ensuring security and Traditional Ecological Knowledge (TEK) as intellectual property. Addressing all these concerns can further enhance a First Nation community's capacity to effectively engage in consultation (McCarthy et al., 2012). First, in terms of the long-term sustainability of the collaborative geomatics system, applications and data must be continuously accessible by the relevant communities in perpetuity. With data housed within the communities (and/or secured data vault) and with the applications accessible through any internet connection, the short-term accessibility is not in question. Over the medium-to-long term, there are concerns around the sustainability of a system that requires upgrades and development from a third-party organization, such as the University of Waterloo's Computer Systems Group / COMAP. Given this issue, the Computer Systems Group / COMAP as mentioned previously are creating a stand-alone version of WIDE so that clients can continue to create their own new applications for their collaborative geomatics system. With some basic training, community members could develop their own applications and evolve their system to meet the future geo-spatial information and knowledge needs of the communities. Once the FN version of the collaborative geomatics system is fully developed and operational, the system will be operated by the FN with a view to generating sustainable income from the consultation process. This will be achieved by requiring proponents to use the system as part of the consultation process, and charging user-access fees.

Second, there are a growing number of collaborative geomatics applications under development or in use by social service agencies, libraries and archives, local economic and community development agencies, recreational and tourism services, conservation authorities, and municipal and regional governments in Ontario. The Stewardship Tracking System (COMAP, 2011a) and the Mennonite Heritage Portrait (COMAP, 2011b) are two examples of applications that demonstrate the practical utility of the collaborative geomatics systems and the WIDE toolkit. The Stewardship Tracking System is a system that enables the tracking of restoration projects (e.g., landscape elements, woodlots, streams, wetlands, prairie habitat) and provides for adaptive management amongst the conservation community of practice (COMAP, 2011a). The Mennonite Heritage Portrait has been designed for community-wide contribution and presentation of the wealth of Mennonite cultural heritage and history in Waterloo region of Ontario, Canada (COMAP, 2011b) and beyond. Existing applications, such as, the Stewardship Tracking System are designed to house sensitive data (e.g., locations of species at risk and areas of municipal well-head vulnerability). Sensitive data such as these are stored in secure locations, either by the relevant provincial ministry or in another secure data storage facility and further secured by appropriate access control methods.

Third, the sensitivity of the data involved in deploying such a system in the context of the Aboriginal communities, is a key concern as TEK is intellectual property. Therefore, in collaborative geomatics, it is crucial that security be a major priority for any application developed for, and with, First Nation communities. Differential access to data is enabled by secure login and password access via individual profiles vetted by the data holder. Such datasets

require high levels of security in terms of physical storage and differential access. Any application that would be developed to collect and store TEK or other culturally, economically or environmentally sensitive data would be developed with the same high-level of data security and differential access as the applications for provincial ministries.

The system enables communities to enhance their capacity to consult with stakeholders in their Traditional Territories with reference to the Crown's duty to consult. The collaborative geomatics system allows for synchronous as well as asynchronous web-based collaboration, that is, FN staff can allow an outside stakeholder temporary, limited access to the system to map, and provide background information (i.e. reports, tabular data) on, a proposed development. This can be done in the context of a "live" or synchronous collaboration session with FN staff in which "control" over the shared screen can be toggled to allow for live negotiations over a high-resolution map with a live chat window. Collaboration can also be asynchronous, allowing proponents to map their proposed project, provide associated documentation or data describing it and the FN staff can access and review this at their convenience. This online collaboration is intended only to supplement face-to-face consultation to allow FN staff to prioritize face-to-face consultation and make more efficient use of their limited resources.

In summary, collaborative geomatics systems based on the WIDE toolkit are powerful web-based technologies that can be used for developing, tracking, monitoring geo-spatial data at both local and regional scales. Collaborative geomatics is ideally suited for integration of TEK and scientific data as complementary forms of knowledge (Tsuji and Ho, 2002) and can enhance the capacity of FNs in dealing with significant development pressure (McCarthy et al., 2011).

Research Approach and Methods

Our research has emerged based on more than 6 years of collaborative research with several First Nations in northern and southern Ontario. We have addressed issues such as, environmental assessment (Whitelaw et al. 2009, Tsuji et al., 2011), social justice (McCarthy et al., 2010), and land use planning (Youden, 2010). Our collaborative research approach and elements of partnership development are described in detail in Sistili et al. (2006).

Our methodological approach uses a case study and explicitly applies participatory action research. Case studies involve the exploration of a single entity or phenomenon bounded by an event and process. As a research strategy, case studies are used in many situations to "improve our knowledge of individual, group, organizational, social, political and related phenomena" (Yin, 2003: 1). The need for case studies arises out of the desire to understand complex social phenomena; a case study allows investigators to retain the holistic and meaningful characteristics of real-life events, such as organizational and managerial processes (Yin, 2003).

According to Whyte (1991:20):

in participatory action research, some of the people in the organization or community under study participate actively with the professional researcher throughout the research process from the initial design to the final presentation of results and discussion of their action.

Our project was conceived, developed and implemented collaboratively with representatives from the Mississaugas of the New Credit First Nation Chief and Council and staff with researchers from the University of Waterloo. In the last three years, our research team has forged a strong, collaborative relationship with the formal leadership (Chiefs and Councils) and staff of several First Nations, including the Mississaugas of the New Credit First Nation (MNCFN). In late 2011, we forged our second formal collaborative agreement between the University of Waterloo and the MNCFN.

Members of the Mississaugas' staff had conducted exhaustive searches for inexpensive, flexible / adaptive, community-based, distributed-authority mapping systems to meet their

information / knowledge management needs related to the duty to consult. In the end, MNCFN staff contacted the University of Waterloo's Computer Systems Group and the Centre for Community Mapping regarding their collaborative geomatics systems. Through a series of preliminary meetings an initial strategy was produced for developing a Mississaugas' collaborative geomatics system including potential funding sources. The first memorandum of collaboration between UW and the MNCFN was developed as a framework for this work and funding was successfully sought through the Government of Ontario's, Creative Communities Prosperity Fund to build a functioning, prototype collaborative geomatics system for testing, ongoing use and further development.

Qualitative data for this work were gathered through participant observation at various project meetings during the ongoing collaboration with the MNCFN. Participant observation refers to "research that involves social interaction between researcher and informants in the milieu of the latter, during which data are systematically and unobtrusively collected" (Taylor *et al.*, 1984: 15). This interpretation of participant observation "assumes that knowledge develops from experience, particularly the experience of social-political action" (Newman, 2000: 24). Throughout the research period from July 2009 to February 2012, we engaged participants in various forums including eight face-to-face meetings, two training sessions and one public colloquium.

Findings and Discussion

Triaging and Fulfilling Consultation Requests: The Mississaugas of the New Credit Case Study

The Mississaugas of the New Credit First Nation is part of the Ojibway (Anishinabe) Nation, one of the largest Aboriginal groups in North America. They settled in southern Ontario around 1634 and their name comes from a work in Ojibway, "Missisakis" with means "many river mouths" which is believed to refer to the mouths of the Trent, Moira, Shannon, Napanee, Kingston and Gananoque rivers within their Traditional Territories (MNCFN, 2008). Through trade with English fur traders who extended "credit" to the Mississaugas, they earned a reputation as a trustworthy people, always paying back the fur traders the following spring. The term "New Credit" refers to the relocation of the Credit River Mississaugas in 1847 (MNCFN, 2008).

Most relevant to this paper is the Mississaugas' recently settled land claims, which formally recognizes their Traditional Territory, therefore invoking the Crown's duty to consult. The Toronto Specific Land Claim, ratified on May 29, 2010, resulted in the MNCFN accepting the Federal Government's offer of \$145 million financial compensation for, "the value of the 250,880 acres in 1805 and lost opportunity to the date of the settlement of this claim" (MNCFN, 2011: 12). This settlement was for two landclaims, the 1805 Toronto Purchase and the Brant Tract in nearby Burlington, Ontario. The claims stems from the supposed "sale" of Toronto by the Mississaugas in 1787. In 1787, Sir John Johnson called a council of the Mississaugas at the Bay of Quinte, Ontario and distributed a total of £1700 in "presents" which took the form of trade goods such as blankets, kettles and gunpowder as a reward to the Mississaugas for their loyalty to the British Crown during the American Revolution (MNCFN, 2011: 5). At this council meeting, Sir Johnson discussed the apparent sale of certain Mississauga lands on the north shore of Lake Ontario, in particular the "carrying place" trail from Toronto to Lake Simcoe (MNCFN, 2011). The discussions at this council were later, wrongly described as the "sale" of Toronto and the £1700 worth of "presents" as payment. Nothing was actually "sold" at that council in 1787 (MNCFN, 2011). While the lands were surveyed by the Crown in 1788, the only description of the lands supposedly sold in 1787 was a letter written twelve years later in 1798 (and see Map 1):

Ten miles square at Toronto, and two to four Miles, I do not recollect which, on each side of the intended road or carrying place leading to Lake Le Clair (Lake Simcoe), then

ten miles square at the Lake and the same square at the end of the water communication emptying into Lake Huron-this Deed was left with Mr. Collins, whose Clerk drew it up to have the courses inserted with survey of these Tracts were completed and was never returned to my office (MNCFN, 2011: 5).

Given the ambiguity, by 1794 the Crown recognized that the 1787 discussions and the 1788 survey did not constitute a valid Treaty and so, the Crown initiated a second Toronto Purchase agreement in 1805 (MNCFN, 2011). On July 31st, 1805 William Claus, Deputy Superintendent General Department of Indian Affairs met with the Mississaugas to negotiate the purchase (MNCFN, 2011). By 1805, the Mississauga Chiefs that had agreed to the 1787 boundaries were dead. Despite this Claus and the Chiefs came to an agreement the next day on the boundaries of the sale based on the 1788 survey and the Crown gave ten shillings to the Mississaugas for the Toronto Purchase (MNCFN, 2011).

In 1984 the Supreme Court of Canada released the following statement regarding the Crown's fiduciary responsibility to the First Nations:

... the nature of Indian title and the framework of the statutory scheme established for disposing of Indian land places upon the Crown an equitable obligation, enforceable by the courts, to deal with the land for the benefit of the Indians. This obligation does not amount to a trust in the private law sense. It is rather a fiduciary duty. If, however, the Crown breaches this fiduciary duty it will be liable to the Indians in the same way and to the same extent as if such a trust were in effect. -Supreme Court of Canada, 1984: 376.

As a result, in relation to the 1805 Toronto Purchase, the Crown had two duties to the Mississaugas (MNCFN, 2011:12):

- To ensure that the River Credit Mississaugas were fully informed as to their rights and the facts regarding any particular transaction.
- To ensure that the Crown paid a reasonable price for the surrendered land.

The Crown failed on both duties – the Mississaugas were not consulted regarding the invalidity of the earlier agreement and the 10 shillings was a paltry and not a “reasonable” price for Toronto. This was the basis for the Toronto Purchase Specific Claim that was originally submitted by the Mississauga Tribal Claims Council in 1986 that eventually led to the May 29, 2010, \$145 million settlement (see list of chronological list of events) (MNCFN, 2011: 12). As a result of this specific land claim, the Crown must consult the Mississaugas of the New Credit (MNCFN) on any proposed developments on MNCFN Traditional Territory. Consequently, this duty has also been downloaded to municipal governments and private sector development companies. and has resulted in a deluge of requests for consultation from across the MNCFN's extensive and rapidly developing Traditional Territory. Since the settlement of their specific land claim, the MNCFN has received approximately 200 requests per month for consultation and have only two or three staff members to deal with these requests (Carolyn King, Personal Communication, Full date, 2011). The requests range from a single sheet of paper announcing an open house to a full box of documents pertaining to an environmental assessment (Carolyn King, Personal Communication, Full Date, 2011). The Mississaugas' leadership and staff, as a result, have expressed the need for land use and occupancy mapping tools and information and knowledge management tools to triage requests for consultation. After an extensive exploration of GIS and related mapping technologies, Mississaugas staff contacted representatives of the University of Waterloo's Computer Systems Group about their “collaborative geomatics” systems (Clynt King, Personal Communication, full date 2011).

The Mississaugas of the New Credit currently face an interesting set of circumstances because of specific land claim agreement acknowledging their traditional territories, the Crown's

duty to consult and rapid urban development in their extensive traditional territories. It represents both an opportunity but also severe drain on their staff resources. Through the collaborative process and extensive participant observation with MNCFN Council and staff members, it became apparent the kinds of information / knowledge management needs that this situation demanded, these needs included the following:

- User-friendly, inexpensive, community-based mapping technologies that would allow for collaborative land use and occupancy mapping of the MNCFN cultural/historical assets within their Traditional Territories for the purposes of developing constraint mapping for development
- Constraint mapping related to the type of proposed development, to support “triaging” or prioritizing of requests for consultation
- The ability to “collaborate” with development proponents to mitigate impacts to their Traditional Territories

Implementing a Collaborative Geomatics System with the Mississaugas of the New Credit

The collaborative geomatics system developed for the MNCFN allows members of the community to participate in the land use and occupancy mapping of their Traditional Territories through the easy to use, web-based interface but protects culturally-sensitive information through differential access and secure user names and passwords. The Computer Systems Group’s WIDE system allows for the development of these systems at a fraction of the cost and in a fraction of the time that regular off-the-shelf packages or custom systems would require. The system allows for the simple mapping of important cultural heritage sites such as historic village locations (see Figure #1) while also allowing for the mapping of proposed development projects by proponents. As previously mentioned the collaborative geomatics system allows for synchronous and asynchronous, online collaboration over a common map with chat capabilities (see Figure #2).

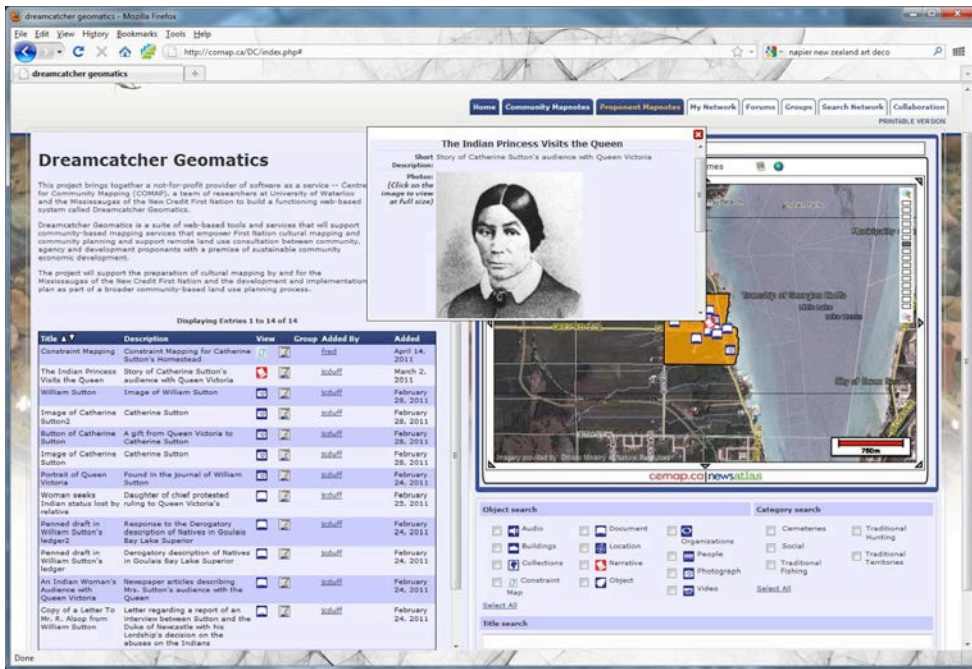


Figure 1: Screen Shot of MNCFN Collaborative Geomatics System Showing an Entry in the System Documenting Catherine Sutton's Audience with Queen Victoria.

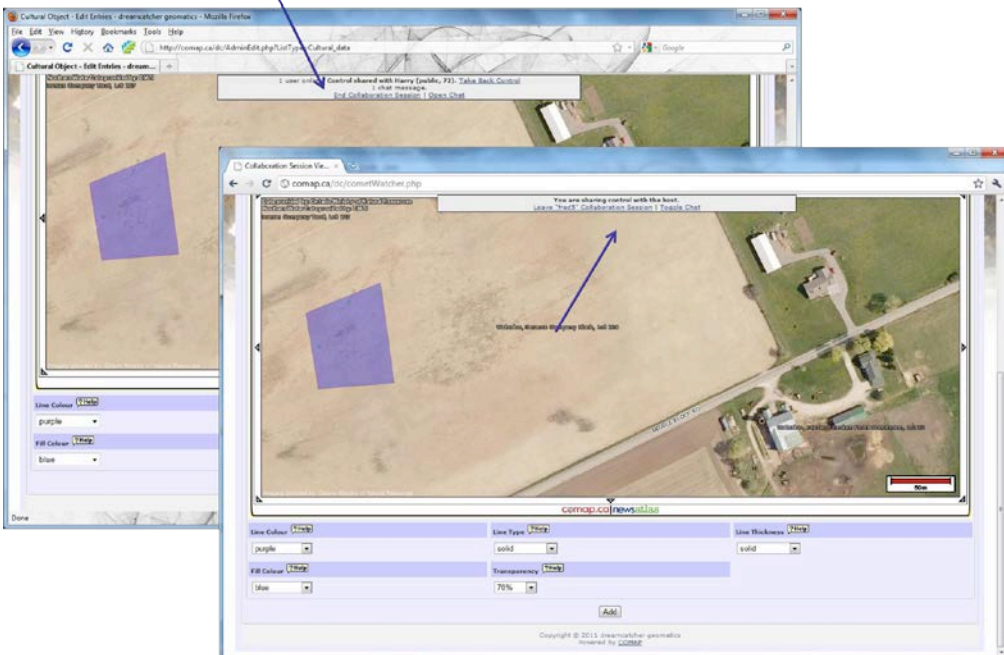


Figure 2: Screen Shot of MNCFN Collaborative Geomatics System Showing How Proponents can Identify Potential Development Sites Using Synchronous Collaboration Via the Web.

The mapping and collaboration capabilities within the collaborative geomatics system will allow MNCFN staff to triage development applications quickly as they arrive and to prioritize requests for face-to-face consultation for those projects that will have significant impact or those impacting important cultural sites. Thus far, initial testing of the system by MNCFN staff has been conducted and accompanied by short training modules. MNCFN Council and staff members believe that the system has the potential to address their needs with reference to triaging requests for consultation through the mapping and collaboration capabilities but also that it has the ability to evolve and address future needs as they arise (Clynt King, personal communication, February 15, 2011).

Opportunities for Further Research: “Decolonizing” Planning and Strategic Environmental Assessment

In a broader historical / political context, MNCFN are being forced, due to the deluge of requests for consultation, to work within existing institutional governance structures associated with environmental assessment and land use planning. The collaborative geomatics tool has the potential to enhance their capacity to work within the system. However, the MNCFN are also interested in examining alternative approaches to planning that might better reflect their culture, understanding of the land and consultation. They are interested in having institutionalized processes, such as land use and environmental assessment policies, changed to reflect and respect their constitutional, Treaty and Aboriginal rights.

Recent work, mainly by Indigenous scholars, on “decolonizing” indigenous research methodologies is pointing to the need for researchers to reflect critically upon how their research reinforces existing colonizing processes (Smith, 1999; Wilson, 2008). Some scholars have explored the concept of “decolonizing planning”, that is, asking the question, can planning processes be “decolonized”? (Porter, 2010; Sandercock, 2008). Decolonization would require an “unsettling” of the spatial conditions and relations involved in land use planning along terms set by First Nations (Porter, 2010; Rankin 2010). Our research team, including MNCFN Council members and staff, recently embarked on a research initiative to explore decolonizing planning knowledge and practices from the standpoint of First Nations. The initiative is structured to allow representatives of the MNCFN to take a leadership role in this research through the design of research questions leading to workshops to explore the concept of decolonizing planning.

Thus far in our collaborative research, one of the key questions raised by MNCFN Council members and staff, was – how can we foster a more strategic-level approach to stemming the flow of requests for consultation? That is, how can the interests of First Nations, with respect to their Traditional Territories, be moved from simply a project-level concern to being ensconced in more strategic-level, plans, policies and programs? This reflects what the strategic environmental assessment (SEA) literature refers to as “tiered” decision-making (i.e Dalal-Clayton and Sadler, 2005; Thérivel, 2004). “[Tiering] is frequently idealized as a hierarchical or tiered process of decision-making. But in reality it is quite different ... often, it is a more complex, iterative process in which the range of choice is gradually narrowed and most options are foreclosed by the project phase” (Dalal-Clayton and Sadler, 2005:18). Therefore, when a policy, plan or programme precedes and influences a project decision, the PPP and the project decision are supposed to be “tiered.” In practice, this does not happen only in a strict top-down manner (i.e. from policy to plan to programme to project). Rather, lower tier assessments and project EIAs can also have a “trickle up” effect, which in turn can lead to an improved awareness of the limitations of prevailing policies, plans and programmes and thus drive improvements (see for example Hildén, et al., 2004).

In our collaborative efforts, areas for future research that examine the relationship between technology, sustainability and decolonizing planning practices with First Nations include: (1) how can training and education support the next generation of GIS practitioners and planners in

collaborative planning efforts with First Nations; (2) what recommendations can be made to rewrite federal and provincial legislation in order to stem the flow of duty to consult requests; and, (3) to explore the concept of “decolonizing” planning to enhance the capacity of First Nations to plan on their own terms or to determine if this is even the right question or approach?

REFERENCES

- Argyris, C., D.A. Schon. 1974. *Theory in Practice: Increasing professional effectiveness*. San Francisco: Jossey-Bass.
- Argyris, C., D.A. Schon. 1978. *Organizational Learning: A theory of Action Perspective*. Reading, Mass.: Addison-Wesley Publishing Company.
- Asch, M., P. Macklem. 1991. "Aboriginal Rights and Canadian Sovereignty: An Essay on R. v. Sparrow", *Alberta Law Review* 29: 498.
- Balram, S., S. Dragicevic, S. 2006. *Collaborative Geographic Information Systems: Origins, Boundaries, and Structures*. Collaborative Geographic Information Systems. S. Balram, S. and S. Dragicevic (Editors). Idea Group. Hershey, PA.: 1-22.
- Coleman, D., S. Li. 1999. "Developing a Groupware-Based Prototype to Support Geomatics Production Management," *Computers, Environment and Urban Systems* 23: 1–17.
- COMAP. 2011a. *Collaborative Geomatics – Stewardship Tracking System*. retrieved February, 2012. [WWW document]. URL: <http://www.comap.ca/index.php?MenuItemID=17>.
- COMAP. 2011b. *Collaborative Geomatics – Mennonite Heritage Portrait*. retrieved February, 2012. [WWW document]. URL: <http://www.comap.ca/index.php?MenuItemID=23>.
- Dalal-Clayton, D.B., B. Sadler. 2005. *Strategic Environmental Assessment: A sourcebook and reference guide to international experience*. London, UK: Earthscan.
- Dunn, C.E. 2007. Participatory GIS – a people's GIS? *Progress in Human Geography*. 31(5): 616–637.
- Elwood, S. 2010. Geographic information science: emerging research on the societal implications of the geospatial web. *Progress in Human Geography* 34(3): 349–357.
- Friedmann, J. 1992. *Empowerment: The politics of alternative development*. Malden, Massachusetts: Blackwell.
- Goodchild, M. F. 2007. Citizens as sensors: the world of volunteered geography. *GeoJournal*. 69(4): 211-221.
- Government of Canada. 2012. *Canadian Environmental Assessment Act (S.C. 1992, c. 37)*. Retrieved February, 2012 from: <http://laws-lois.justice.gc.ca/eng/acts/C-15.2/>.
- Government of Ontario. 2006. *Draft Guidelines for Ministries on Consultation with Aboriginal Peoples Related to Aboriginal Rights and Treaty Rights*. Toronto: Ministry of Aboriginal Affairs.
- Government of Ontario. 2012a. *Planning Act, R.S.O. 1990, c. P.13*. Retrieved February, 2012 from: www.e-laws.gov.on.ca/html/statutes/.../elaws_statutes_90p13_e.htm.
- Government of Ontario. 2012a. *Environmental Assessment Act, R.S.O. 1990, c. E.18*. Retrieved February, 2012 from: www.e-laws.gov.on.ca/Download?dID=42071.
- Haklay, M., A. Singleton, C. Parker. 2008. Web Mapping 2.0: The Neogeography of the GeoWeb. *Geography Compass*, 2(6): 2011-2039.
- Hildén, M., E. Furman, M. Kaljonen. 2004. Views on planning and expectations of SEA: the case of transport planning. *Environmental Impact Assessment Review*, 24(5): 519–536.
- Isaac, T. 2001. *Aboriginal and Treaty Rights in the Maritimes: The Marshall Decision and Beyond*. Saskatoon: Purich Publishing.
- Isaac, T., A. Knox. 2004. Canadian Aboriginal Law: Creating Certainty in Resource Development. *University of New Brunswick Law Journal*. 53(3).
- Jankowski, P., T. Nyerges, S. Robischon, K. Ramsey, D. Tuthill. 2006. "Design Considerations and Evaluation of a Collaborative, Spatio-Temporal Decision Support System." *Transactions in GIS*, 10(3): 335-354.
- Lawrence, S., P. Macklem. 2000. "From Consultation to Reconciliation: Aboriginal Rights and the Crown's Duty to Consult", *Canadian Bar Review*, 1(29): 252.
- McCarthy D.D.P., G.S. Whitelaw, S. Anderson S., D. Cowan, F. McGarry, A. Robins, H. Gardner, C. Barbeau, N. Charania, Z. General, J. Liedtke, C. Sutherland, P. Alencar,

- L.J.S. Tsuji. 2011. Collaborative geomatics and the Mushkegowuk Cree First Nations: Fostering adaptive capacity for community-based sub-arctic natural resources management. *Geoforum*. 10.1016/j.geoforum.2011.07.015.
- Mississaugas of the New Credit First Nation (MNCFN). 2008. *The History of the Mississaugas of the New Credit First Nation*. New Credit, Ontario: Mississaugas of the New Credit.
- Mississaugas of the New Credit First Nation (MNCFN). 2010. *Toronto Purchase Specific Claim: Arriving at an agreement*. New Credit, Ontario: Mississaugas of the New Credit.
- Newman, D. 2010. *The Duty to Consult Doctrine and Representative Structures for Consultation with Métis Communities and Non-Status Indian Communities*. Ottawa: Institute on Governance.
- Newman, W.L. 2000. *Social Research Methods: Qualitative and Quantitative approaches*. 4th ed. Boston, USA: Allyn and Bacon.
- Reason, P. 1988. *Human Inquiry in Action: Developments in New Paradigm Research*. London: Sage.
- Reason, P. 1994. Three approaches to participative inquiry. In *Handbook of Qualitative Research*, NK Denzin and YS Lincoln (eds.). Thousand Oaks: Sage.
- Reason, P., J Heron. 1995. Co-operative inquiry. In *Rethinking Methods in Psychology*, R Harre, J Smith and L Van Langenhove (eds.): 122-142. London: Sage.
- Schlossberg, M., E. Shuford. 2005. Delineating 'Public' and 'Participation' in PPGIS. *URISA Journal*. 16(2): 15-26.
- Schon, D.A. 1983. *The Reflective Practitioner: How Professionals Think in Action*. New York: Basic Books.
- Sieber, R. 2006. Public Participation Geographic Information Systems: A Literature Review and Framework. *Annals of the Association of American Geographers* 96(3): 491-507.
- Sistili, B., M. Metatawabin, G. Iannucci, L.J.S. Tsuji. 2006. "An Aboriginal perspective of the remediation of Mid-Canada Radar Line sites in the sub-Arctic: A partnership evaluation", *Arctic*. 59:142-154.
- Smith, L. T. 1999. *Decolonizing methodologies: Research and Indigenous Peoples*. New York, NY: St. Martin's Press.
- Statistics Canada. (2009). 2006 Census of Canada topic based Aboriginal Peoples. Retrieved February, 2012 from Statistics Canada: <http://www5.statcan.gc.ca/subject-sujet/result-resultat.action?pid=10000&id=10000&lang=eng&type=STUDIES&pageNum=1&more=0>.
- Supreme Court of Canada. 1984. *Guerin v. The Queen*, CanLII 25 (SCC), [1984] 2 SCR 335, Retrieved February, 2012 from CanLII: <http://canlii.ca/t/1l1pfn>.
- Taylor, D.R.F. 2003. The Concept of Cybercartography. In: M. Peterson (Editor), *Maps and the Internet*. Elsevier, Cambridge.
- Taylor, S.J., J. Steven, R. Bogdan. 1984. *Introduction to Qualitative Research Methods*. New York: John Wiley and Sons.
- Taylor, D.R.F., S. Pyne. 2009. The history and development of the theory and practice of cybercartography. *International Journal of Digital Earth*.
- Thérivel, R. 2004. *Strategic environmental assessment in action*. London ; Sterling, VA: Earthscan.
- Tsuji, L.J.S., E. Ho. 2002. Traditional environmental knowledge and western science: in search of common ground. *Canadian Journal of Native Studies* 22:327-360.
- Turner, A. J. 2006. *Introduction to Neogeography*. Sebastopol, CA: O'Reilly Media Inc.
- Yin, RK. 2003. *Case study research: design and methods* 3rd ed. Thousand Oaks, Calif.: Sage Publications.
- Youden, H.L. 2010. *Planning In Ontario's Far North: Preservation, development and culture in policy*. Masters Thesis. School of Environmental Studies, Queen's University, Kingston, Ontario.

- Whitelaw, G.S., D.D.P. McCarthy, L.J.S. Tsuji. 2009. "The Victor diamond mine environmental assessment process: A critical First Nation perspective", *Impact Assessment and Project Appraisal Journal*. 27: 205-215.
- Whyte, W.F. 1991. *Participatory Action Research*. Newbury Park, California: Sage Publications.
- Wilson, S. 2008. *Research is ceremony: Indigenous research methods*. Black Point, Nova Scotia, Canada: Fernwood Publishing.

ABOUT THE AUTHORS

Dr. Daniel D. McCarthy: Dr. McCarthy is a faculty member with Social Innovation Generation as well as an assistant professor in the Faculty of Environment, University of Waterloo. He has strong research interests and partnerships that relate to fostering the adaptive capacity for community-based, natural resource management, working closely with Mushkegowuk Cree First Nations in James Bay. Other research that explores stewardship, livelihoods, and learning is connected to the Long Point World Biosphere Reserve and the Oak Ridges Moraine.

Graham Whitelaw: Associate Professor in the School of Planning at Queen's University, Canada.

Carolyn King: Councillor with the Mississaugas of the New Credit First Nation, Canada.

Clynt King: Former Chief and Geomatics Environmental Technician with the Mississaugas of the New Credit First Nation, Canada.

Leela Viswanathan: Assistant Professor in the School of Planning, Queen's University, Canada.

Dr. Don Cowan: Donald D. Cowan is the director of the Computer Systems Group at the University of Waterloo. He was the founding chairman of the Computer Science Department at the University of Waterloo, now the David R. Cheriton School of Computer Science. His software engineering interests focus on web-based systems, particularly in reducing the number of abstractions required to produce and validate them. Reducing the number of abstractions will lower the barriers for individuals and organizations to build and maintain large-scale, complex, web-based systems. Professor Cowan and his team have developed the Web Informatics Development Environment (WIDE), which includes advanced mapping engines first created in the early 90s. He has worked with various organizations in applying the WIDE tools and technologies to develop over 60 complex web-based systems in environment, public and population health, cultural heritage, social services, Aboriginal affairs, business, and tourism. He is the author or co-author of 240 refereed papers and 15 books in computer / communications, software engineering, education, environmental information systems, and mathematics. Among several honours, he has received the Brazilian National Order of Scientific Merit - Grand Cross, Brazil's Highest Scientific Honour (2006). He is also a Distinguished Scientist of the Association for Computing Machinery (2010).

Fred McGarry: Executive Director at the Centre for Community Mapping (COMAP), Canada.

Scott Anderson: Works for the Centre for Teaching Excellence at the University of Waterloo, Canada.

The International Journal of Technology, Knowledge and Society explores innovative theories and practices relating technology to society. The journal is cross-disciplinary in its scope, offering a meeting point for technologists with a concern for the social and social scientists with a concern for the technological. The focus is primarily, but not exclusively, on information and communications technologies.

Equally interested in the mechanics of social technologies and the social impact of technologies, the journal is guided by the ideals of an open society, where technology is used to address human needs and serve community interests. These concerns are grounded in the values of creativity, innovation, access, equity, and personal and community autonomy. In this space, commercial and community interests at times complement each other; at other times they appear to be at odds. The journal examines the nature of new technologies, their connection with communities, their use as tools for learning, and their place in a “knowledge society”.

The perspectives presented in the journal range from big picture analyses which address global and universal concerns, to detailed case studies which speak of localized social applications of technology. The papers traverse a broad terrain, sometimes technically and other times socially oriented, sometimes theoretical and other times practical in their perspective, and sometimes reflecting dispassionate analysis whilst at other times suggesting interested strategies for action.

The journal covers the fields of informatics, computer science, history and philosophy of science, sociology of knowledge, sociology of technology, education, management and the humanities. Its contributors include research students, technology developers and trainers, and industry consultants.

The International Journal of Technology, Knowledge and Society is a peer-reviewed scholarly journal.

ISSN 1832-3669



Copyright of International Journal of Technology, Knowledge & Society is the property of Common Ground Publishing and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.