

# COMMUNITY MAPPING AND GOVERNMENT MAPPING: POTENTIAL COLLABORATION?

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## Convergence in Geomatics

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## ABSTRACT

The advent of community mapping, based on GPS and volunteer work, is providing a source of up-to-date and accurate geospatial data. Moreover, these data are easily and freely accessible to the average user; an open licence gives the proper rights to use these data.

This creates a challenge for the various governmental mapping organizations which have well established mandates to map the country. Questions arise on the rate of change, the standards, the coverage and the quality of the data. Could official mapping organizations benefit from the effort of that volunteer work and create a potential bridge between these two worlds?

In April 2008, after some of their staff were involved with the OpenStreetMap (OSM) Foundation on a personal basis in data collection, Natural Resources Canada (NRCan) has established links with the OSM Foundation. NRCan Unrestricted Use Licence did allow the OSM to import Canvec data; similar discussions are being held with the Canada Council on Geomatics to create analogous links with GeoBase.

Meanwhile, NRCan has initiated an investigation of the data available from the OSM website. The first phase is to compare, in a passive mode, the two data holdings to determine the differences (change detection). For the moment, the emphasis is on geometry rather than attribution. The focus is also put on the road network: the National Road Network (NRN) is broadly used as a source and is complemented by field collection by individuals who find differences. A comparison of the data highlights these differences between OSM and the NRN. The project is at the stage of identifying the mechanisms to circulate the detected changes among responsible authorities.

A second phase is envisioned as an active mode and potentially leads to the direct inclusion of Community Mapping Data into NRCan databases and other governmental holdings. There may be an issue around intellectual property and licensing: already discussions are underway between OSM and NRCan.

## 1. INTRODUCTION

The role of the Mapping Information Branch (MIB) at Natural Resources Canada (NRCan) is to fully and accurately represent the Canadian landmass. The base scale is 1: 50 000 and cover basic themes such as hydrography, topography, land cover, roads, administrative boundaries, place names, railways and energy networks. The two major topographic initiatives are based on the initial acquisition and updating of data; they both cover the paper maps and the digital maps. These were programs started in the forties and they are still active. There are still 600 maps to acquire in the North of Canada and the updating of data is an ongoing process (Jolicoeur, 2008).

Since the first maps were acquired, the issue of updating arose. Updating of topographic data originally uses traditional information sources (aerial photographs and satellite imagery). In the last decade, more collaboration has been developed with other agencies responsible for specific data layers, both at the provincial/territorial level and at the federal level. Through the GeoBase agreements, this provided much of the new updated information: hydrography, road network and land cover. The updating process is not addressing all of the original entities; some features are simply not updated. Updating the maps for the whole Canadian landmass, covering over 10 000 000 km<sup>2</sup> and over 13 200 maps at the basic scale of 1: 50 000 is a

challenge. With the improvements in technology and the increasing involvement of the general public in the field of geolocation, collaborative cartography has become a promising opportunity to perform updates. Web collaborative mapping is being investigated. One option is to work with a limited community of experts, which would be granted access to restricted systems. Another option would be collaborating with an open public database, where everyone has the possibility to provide information; this sharing of data would benefit both the community and MIB. This paper will focus more on this last option.

Our explorations lead us to the OpenStreetMap (OSM) community, an open source/open data project that gives access to free volunteered geographic information (VGI) (<http://wiki.openstreetmap.org>). Everyone can add, edit, or delete data as long as they register to the OSM website. A preliminary investigation showed the potential of using data available from OSM for change detection (Figure 1). There are two potential approaches to collaborating with OSM: first, how to contribute to the community and second, how to use community data for change detection?

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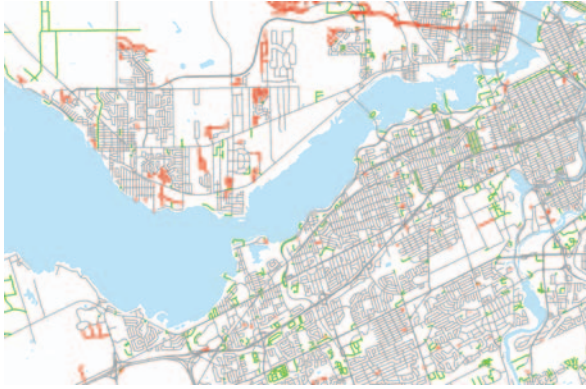


Figure 1. A view of the detected changes of the Ottawa area. In grey, the OpenStreetMap road data; in green, data missing in OSM; and in red, data missing in NRCan data.

## 2. VOLUNTEERED VERSUS AUTHORITATIVE MAPPING

Mapping countries accurately was, until recently, reserved to professional cartographer highly skilled in their field. The mapping agencies elaborated standards and specifications for the production of maps, and they acquired authority over the matter, which derives from their reputation for quality (Goodchild, 2007). With the advent of geographic positioning systems (GPS), Web 2.0 technology and access to open source geographic information systems (GIS), a new tendency in the world of geography emerged. Recently, a community of mappers interacting via internet are mapping their local area and landscape and make it freely available on the web. Volunteered geographic information (VGI) was born and OSM is one of the most popular of these VGI. Its growth in popularity is still increasing.

First of all OSM is a community of people who share a common interest: mapping the World. The way it works is similar to the well known Wikipedia, where users interact on the web to create an encyclopaedia. Its goal was to produce geographical information, e.g. maps, through a technical infrastructure originally initiated by Steve Coast and hosted in University College London. One of the key motivation was to provide users map data that is free to use and editable. In the European countries, accurate geographical data was not freely available, was usually expensive and out of reach for individuals (Haklay and Weber, 2008). Also, rapid changes in the geographic information are not propagated instantaneously due to the high cost of mapping; agencies update cycles are infrequent. This motivated the OSM project that started in 2004. In 2006, there were 2500 registered users (only registered users may add or edit data in OSM) which increased to 25 000 in the beginning of 2008 (Van Der Biest, 2008). There is now over 245 000 "Producers" (neologism based on user and producer), showing the exponential growth of the enthusiasm for OSM.

Data produced by governmental mapping agencies such as MIB were, until recently, the only source of geographic information. In Canada, this data is now available freely over the Web through the Geobase and Geogratis sites ([www.Geobase.ca](http://www.Geobase.ca) and [www.geogratis.gc.ca](http://www.geogratis.gc.ca)). Complex and well documented processes were developed in order to acquire such data. And over time, both the organisation and the geographic information it produced acquired trust from the users. The data is well

organised, uniform all over Canada and the quality is controlled thoroughly. It is also associated with extensive metadata in the form of product specifications, feature catalogue and dataset information (validity date, data sources, and description of acquisition processes...). There is no such wide-ranging metadata information in organisations like OSM. Represented in figure 2 is an overview of what both organisations have to offer and what they have in common: geographic features. Based on this key observation, a solution would be to use the geographic features collected from both our organisation to detect changes in our databases. Comparing features from OSM database to features in MID database and work with the concerned authorities for the update process.

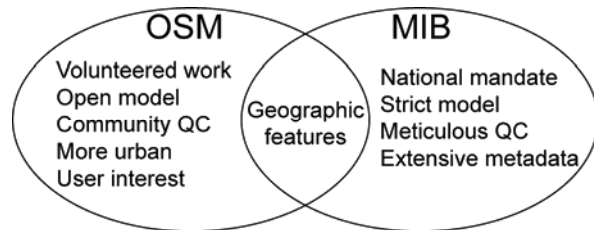


Figure 2. Overview of OSM and MIB cartographic perspectives showing their different mandates and objectives.

## 3. PROPOSED MODEL FOR DATA EXCHANGE

Obviously, the more the data is similar to NRCan products, easier the comparison is. This is the case for the road network since the OSM community has almost completed its Canadian road network by combining community's data and NRCan data (Canvec product). For other themes, community's efforts have been put on Canvec topographic map data conversion and upload.

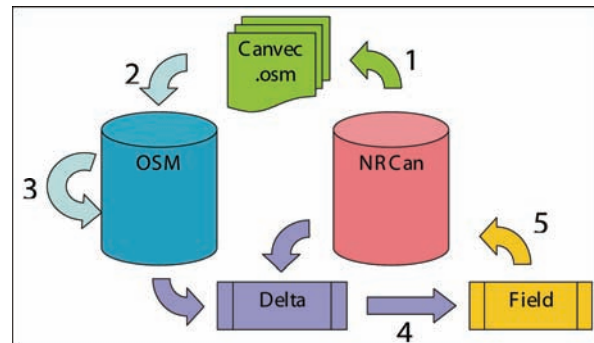


Figure 3: An overview of the anticipated data flow between OSM and MIB.

Considering these facts, CTIS has decided to help the OSM community by providing them the Canvec product in .osm format. The objective is to ease the data flow between NRCan and OSM (Figure 3). The anticipated process pictured in figure 3 could be described into these main steps. NRCan is providing Canvec data in .osm format to the community (1). OSM contributors upload this data in areas they are interested in into the OSM database (2). Contributors update/modify the data, either based on GPS tracks or on available imagery (3). On a regular basis, the data is extracted from the OSM database and compared with NRCan's data (Delta). Differences found are sent to responsible authorities for validation (4). If a difference

found is valid, authorities update the data through field work. The data is then sent back to NRCan where it is integrated to the database (5). Field completion is necessary because OSM data cannot yet be included because of licence issues.

#### 4. CONCLUSION

The orientation this collaboration is creating opens lots of possibilities. Questions still arise concerning the differences between standards and models (OSM and official federal data), and the themes that could be used for updating data. Resources for mapping Canada are limited. Is OSM a solution, at least for urban areas where the OSM mappers are concentrated? So far, the comparison has been conducted on feature's geometry. What will come out of the comparison of the feature's attributes?

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