Digital Information Systems for Community Planning in Nunatsiavut

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Background

According to the recent report on Nunatsiavut community priorities, challenges, and opportunities, there is a significant lack of desirable building land in all communities (Nain Research Centre Report 12-01). Available building space is constrained by a combination of landscape hazards, restricted areas and ground that is unsuitable for development.

Land uses, including garbage dumps, airports, cemeteries, quarries and housing developments, are competing for the minimal amount of desirable land that is available. Meanwhile, changing climate may be impacting land suitability as a result of thawing permafrost affecting land stability or changing precipitation and snowmelt patterns and disrupting community drainage.

Figure 1. For the most part, Nunatsiavut communities are located on the coast, are backed by steep bedrock slopes, and have restricted land use areas due to contaminated sites, transportation corridors (e.g. roads, airport) or community services (e.g. water supply, garbage dump). Together, these constraints limit suitable building land and community development.

Our *Digital Information System for Communities* (DISC) project addresses the issue of building land in communities through the production of planning constraint maps that identify available, suitable areas for development across a range of land uses and under current and projected future climate states.

Study Location and Context

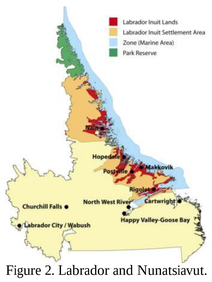


Figure 2. Labrador and Nunatsiavut.

Nunatsiavut is located on the north coast of Labrador in Eastern Canada and is the homeland of Labrador Inuit. Nunatsiavut was the first Inuit region in Canada to achieve self-government, granted with the signing of the Labrador Inuit Land Claims Agreement in 2005 and resulting in the establishment of the Nunatsiavut Government.

As the southernmost Inuit region in the world, Nunatsiavut struggles with a long legacy of infrastructure design that is ill-suited to the environmental demands of a sub-arctic climate and does not meet the lifestyle needs and preferences of Labrador Inuit.

Compounding these issues are the implications of climate variability and change. Nunatsiavut is currently experiencing some of the strongest and earliest effects of climate change, placing added stress on community infrastructure, altering travel routes across the sea ice and presenting a host of new hazards and risks for residents.

Existing Data

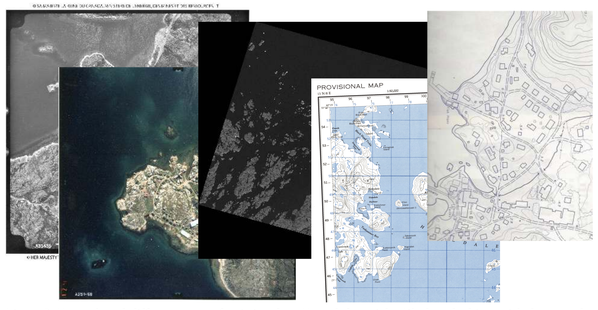


Figure 3. Examples of different types of existing data. From left to right: Black and white aerial photograph, colour aerial photograph, satellite imagery, map sheet, and community planning map.

Existing data such as aerial photographs, satellite data, and topographic map sheets are being compiled from federal, provincial, and community sources. Analogue data are being digitized and georeferenced. Several gaps exist in currently available datasets. We have found that there are significant challenges in accessing and retrieving mapped data for communities.

New Data Collection

Planning constraint maps combine existing community information with Inuit Knowledge and new geoscientific data in a georeferenced information database to support community infrastructure planning and development decisions. Each community database compiles, for the first time, digital information on community infrastructure and resources, landscape characteristics and hazards, regulated land areas, protected and valued spaces and places, climate scenarios and environmental modeling.

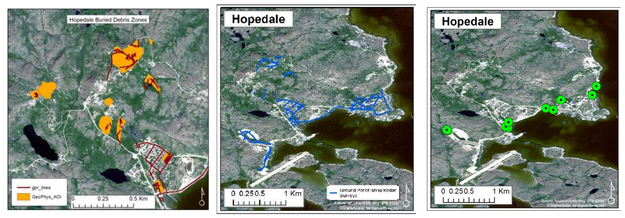


Figure 4. Left: a summary of the areas subject to geophysical surveying for buried debris. Centre and right: all GPR lines surveyed and sample points taken, respectively, in Hopedale in the summer of 2013.

Figure 7. Top left: contaminated sites close to an abandoned US military base are of concern in Hopedale. Top right: Ground Penetrating Radar (GPR) was used to confirm and map the existence or absence of buried debris, some of which may contain polychlorinated biphenyls (PCBs). Bottom left: a survey grade Global Positioning System (GPS) was used to map drainage networks and drainage infrastructure. Bottom right: coastal transect lines were surveyed to support morphological mapping and to identify sediment sources and sinks.

Hopedale, Labrador

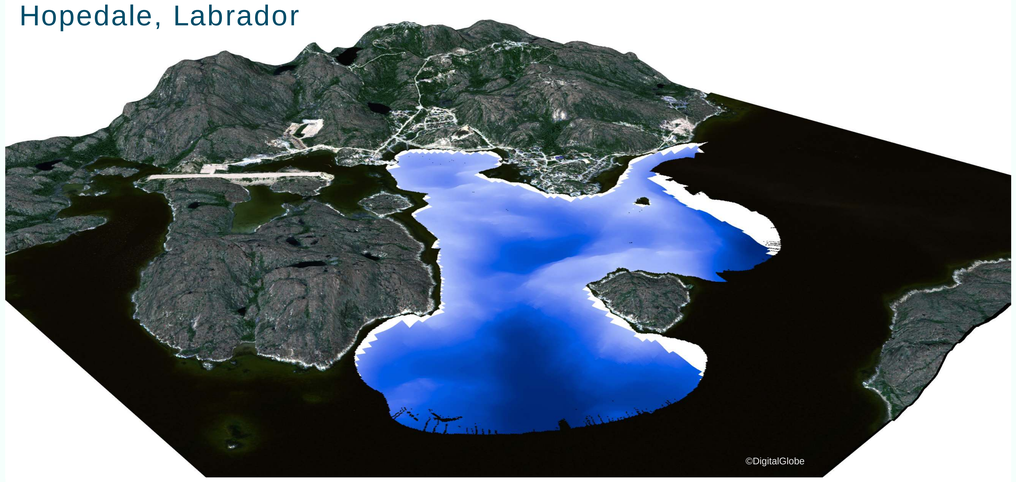


Figure 6. Satellite imagery of Hopedale and surrounding area overlaid on a digital elevation model with bathymetry of the harbour. Base imagery: WorldView II satellite imagery; bathymetry provided by Andre Roy, Canadian Hydrographic Service; and elevation derived from stereo-pair Worlview II imagery.

Figure 5. Top left and right: some buildings in Hopedale are subject to differential settlement, resulting in infrastructure damage. Bottom left: Ground Penetrating Radar (GPR) was used to survey roads and representative areas of surficial cover in order to assess the presence of permafrost. Bottom right: Cores were drilled in suitable soils to sample sediments at depths of up to 3 m. Core drilling was used to field check remotely sensed ground data.

Valued Spaces and Places

Semi-structured focus groups, including participatory mapping exercises, were conducted by team members and partners (Health, Environment, and Indigenous Communities Research Group at Trent University), to identify and compile local spaces and places that are valued by the community for their recreational, cultural, subsistence or social qualities and use.

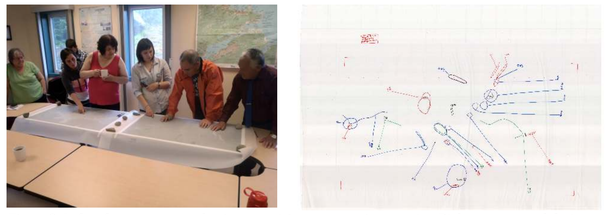
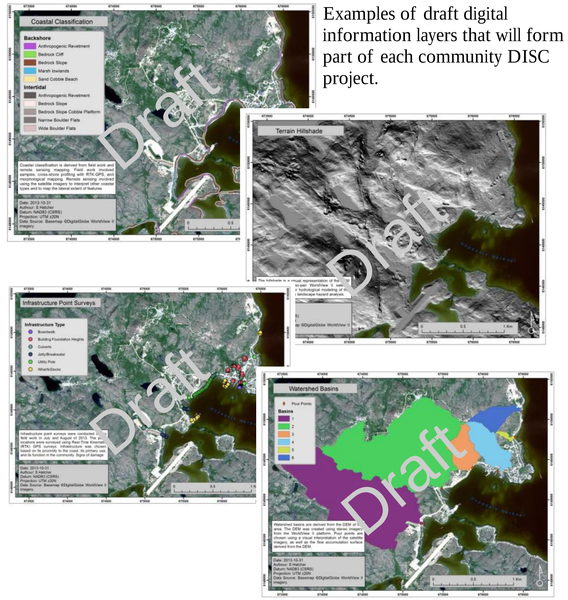


Figure 8. Left: a focus group conducting a participatory mapping exercise. Right: map created during a community mapping exercise.

DISC Information Layers



Examples of draft digital information layers that will form part of each community DISC project.

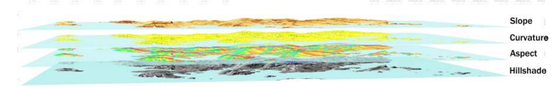


Figure 9. Draft versions of digital information layers including coastal classification, hillshade, infrastructure, watershed basins, and hypsographic terrain layers.

Informing Community Planning

The DISC project emerged from a widely recognized need for more sustainable and locally appropriate approaches to community planning and development. The applicability of, and engagement with, the DISC database will be assessed during community planning revisions in Hopedale in 2013/14, and appropriate modifications made for planning updates in the other four Nunatsiavut communities by 2015.

Figure 10. A community planning session with Hopedale council members and community planners – FOTENN Consultants Inc., in Hopedale, December 2013.

Municipal plans and development regulations that are based on community values, needs and concerns and informed by the most current planning constraint data, including climate and landscape hazards, are excellent tools to guide community governments in making day-to-day land use and development decisions that build long-term sustainable, climate-adapted communities.

For more information and a copy of this poster please visit:

http://nainresearchcentre.com

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ArcticNet