Introducing the Government of Yukon Infrastructure Vulnerability to Permafrost Degradation Project

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ABSTRACT
The Infrastructure Vulnerability to Permafrost Degradation Project is a collaborative initiative between the Government of Yukon Department of Highways and Public Works and the Yukon Geological Survey slated for completion March, 2011. The primary objective of this project is to complete an assessment report on the vulnerability of Yukon government infrastructure to future permafrost degradation. Components of the project will include: completing an assessment of the vulnerability of Yukon government building infrastructure to future permafrost degradation; compiling a publicly accessible baseline inventory of permafrost, climatic, and Yukon government infrastructure spatial data. It is anticipated that the information compiled for this project will include spatial and temporal data suitable for GIS analyses and it will be made publicly available through a web portal hosted by the Yukon Geological Survey.

RÉSUMÉ
Cette initiative, qui doit se terminer en mars 2011, est le fruit d'un partenariat entre le ministère de la Voirie et des Travaux publics du gouvernement du Yukon et la Commission géologique du Yukon. L'objectif principal de ce projet est la préparation d'un rapport d'évaluation relativement à la vulnérabilité des infrastructures du gouvernement du Yukon liée à la dégradation du pergélisol dans l'avenir. Les éléments du projet comprendront, d'une part, une évaluation relative à la vulnérabilité de l'infrastructure des bâtiments du gouvernement du Yukon à la future dégradation du pergélisol et, d'autre part, la constitution d'une base de données accessible au public comprenant un inventaire de données spatiales de référence relativement au pergélisol, au changement climatique et aux infrastructures du gouvernement du Yukon. On prévoit que les renseignements ainsi obtenus pour ce projet comprendront des données spatiales et temporelles utiles aux fins d'analyses dans le contexte du système d'information géographique; de plus, le public pourra en prendre connaissance par l'intermédiaire d'un portail Web géré par la Commission géologique du Yukon.

1 INTRODUCTION

There are a number of research projects currently underway in the Yukon documenting the past and present states of permafrost. However, there remains an outstanding need to collectively evaluate these findings. This project will compile and synthesize permafrost data gathered and currently being collected in the Yukon by a variety of groups ranging from government, engineering firms, industry, and academia. The resulting data will then be made publicly accessible through the Yukon Geological Survey website (http://www.geology.gov.yk.ca/822.html).

This work aims to facilitate the incorporation of changing climatic conditions in future Yukon government infrastructure maintenance and construction planning. It is anticipated that by ensuring that infrastructure is resilient to degrading permafrost conditions, government expenses will be reduced and public safety increased.

2 BUILDING INVENTORY

The Government of Yukon Department of Highways and Public Works will complete an inventory and ranking of the social and economic importance of its vertical infrastructure. This inventory will contain information on the structural integrity of the buildings and any damages directly caused by degrading permafrost. It is anticipated that the results from this project will result in the information required to implement cost saving mitigation procedures for the construction of new buildings and the maintenance of existing structures. This is quite important as the majority of Yukon buildings exist within the extensive and sporadic discontinuous permafrost zones which have mean annual ground temperatures within two degrees of 0˚C (Smith et al. 2010).

2.1 Permafrost Database

A permafrost database is being created which will consist of all available baseline permafrost data that documents air and ground temperatures, ice content, surficial geology, and active layer depths throughout the territory. Permafrost characteristics will be the focus of this work, but data documenting other environmental and climatic factors that affect permafrost and infrastructure will also be taken into consideration, such as air temperature, precipitation records, and landslide activity.

GIS data will be derived from the compiled baseline data to analyze regional distribution patterns and trends. This data will be posted online for public access and outreach via a Google Earth interface that will provide access to new data and links to permafrost data in existing databases and archives. Surficial Geology, vegetation cover, and other shape files suitable for GIS analyses will also be made publicly available and could be used for projects such as the modelling of permafrost distribution and potential changes due to climatic change.

2.2 Infrastructure Risk and Vulnerability Assessment

An Infrastructure Risk and Vulnerability Assessment protocol will be created through: 1) spatial analyses of permafrost and infrastructure; 2) current and future climatic projections; 3) regional infrastructure importance. It will identify risks, vulnerabilities, and opportunities to effectively incorporate climate change adaptation into building structure design, development, and management decision making. It is anticipated that the assessment will be incorporated into operation and management practices and standards. For example, the assessment will help determine the infrastructure replacement schedule and site location placement for new infrastructure.

3 REQUEST FOR YUKON PERMAFROST DATA

In order for this project to be as successful as possible it is important that researchers and those gathering data on or related to permafrost in the Yukon contribute to the database. The addition of these new data will augment the current permafrost data housed at the Yukon Geological Survey. Examples of data that have been contributed thus far include thermistor data from boreholes located under and adjacent to buildings, ground temperature and snow depth data, and theses and dissertations resulting from permafrost research undertaken in the Yukon. Additional bore hole temperature, ground surface, snow depth, air temperature, and infrastructure data would greatly bolster the current collection of permafrost data housed at YGS. The data does not have to be submitted prior to the publication of its interpretation and recognition of the submitter of the data will be available in the accompanying metadata file attributed to each dataset.

In addition to being used in the creation of the Infrastructure Risk and Vulnerability Assessment, the database will enable planners and researchers to easily gain access the spatial and temporal patterns of permafrost temperature, active layer thickness, and other parameters essential for understanding the current and future condition of the cryosphere in the Yukon.

For further information on the project or to submit Yukon permafrost data, please contact:

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REFERENCES

Smith, S.L., Romanovsky, V.E., Lewkowicz, A.G., Burn, C.R., Allard, M., Clow, G.D., Yoshikawa, K., and Throop, J. 2010. Thermal State of Permafrost in North America: A Contribution to the International Polar Year. *Permafrost and Periglacial Processes*, 21: 117-135.