

Link between United Nations Sustainable Development Goals and CSA S501:14 Moderating the Effects of Permafrost Degradation on Existing Building Foundations – Industry Perspective

Enabling Sustainable Development through Standards



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES



13 CLIMATE ACTION



United Nations Sustainable Development Goals Addressed:

SDG 9 – Industry, Innovation and Infrastructure,
SDG 11 – Sustainable Cities and Communities, and
SDG 13 – Climate Action

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Summary

CSA Group is a leader in standards research, development, education, and advocacy with the goal of enhancing the lives of Canadians through the advancement of standards in the public and private sectors. The purpose of this study is to determine the potential support towards achieving the United Nations Sustainable Development Goals (UN SDGs) through the use of the Canadian Standard Association's (CSA) S501:14 *Moderating the Effects of Permafrost Degradation on Existing Building Foundations* by typical standard users. Additionally, the study aims to determine whether there are strong linkages to UN SDG 9 - Industry, Innovation and Infrastructure; UN SDG 11 - Sustainable Cities and Communities; and UN SDG 13 - Climate Action. CSA S501:14 was linked to the stated SDGs through a robust mapping methodology. This study explores whether linkages can be made from an industry perspective and describes perspectives from an environmental engineering firm and an architectural design firm located in Northern Canada that use CSA S501:14 in different capacities. Additional background of the standard and implementation information was obtained through interviews with members of the Technical Committee that wrote CSA S501:14. These interviews cast light on how sustainability and environmental issues are addressed within their companies and by using the standard, which provided connections to the SDGs mentioned above.



1 Introduction

The CSA S501:14 is part of a suite of 11 CSA standards and guidelines that address issues found within Northern Canada. CSA Group developed these documents as part of the Standards Council of Canada’s (SCC) National Infrastructure Standardization Initiative (NISI) and was published in 2014, reaffirmed in 2019, and revised in 2021. There are indications that it may be considered for reference within the National Building Code of Canada (NBC) in future iterations. The SCC’s NISI group of standards was created to address the threat of climate change in Northern communities and increase the knowledge base and best practices available to those living in these communities. While the CSA S501:14 standard is intended primarily to be used by engineers, architects, and other related officials, it does provide plain-language descriptions of permafrost loss and impacts, plus best practices that can be utilized by educators, the general public, and other groups to build community knowledge regarding this subject area. The CSA S501:14 standard was created to generate best practices regarding building maintenance and design that could preserve permafrost and prevent the loss of critical infrastructure within Northern communities due to permafrost collapse. Industry perspectives further describe this

standard as contributing to the health and well-being of the communities, due to the preservation and creation of livable buildings, reducing the economic costs to the community through the preservation of critical infrastructure, and contributing to the sustainable use of building resources in the North. By preserving permafrost and creating secure infrastructure, the requirements and recommendations within this standard further help build communities that are resilient and able to withstand the impacts of climate change, and contribute to climate change adaptation.

The UN SDGs in this study are as follows:

 <p>9 INDUSTRY, INNOVATION AND INFRASTRUCTURE</p>	SDG 9 – build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
 <p>11 SUSTAINABLE CITIES AND COMMUNITIES</p>	SDG 11 – make cities and human settlements inclusive, safe, resilient, and sustainable.
 <p>13 CLIMATE ACTION</p>	SDG 13 – take urgent action to combat climate change and its impacts.

Based on CSA Group's SDG mapping methodology, these three SDGs have been identified to be the ones most strongly related to CSA S501:14, and this study will explore these connections.

Information for this study was obtained from the Canadian Standards Association, the UN SDGs website, and published material about the standard, with the majority of information being obtained from the interviews with two standard users and members of the Technical Committee. Furthermore, CSA S501:14 was reviewed to confirm the interview findings and collect additional information.

2 Results and Impact

2.1 Industry Use and Perspective of CSA S501:14

Interviews with two standard users described the different real-life applications and uses of the standard, as well as providing further context of the Northern experience and the standard's role within it. Through the interview process, it became clear that the contextual understanding of the standard, as well as its services to a community, are greater than what is described in the text of the standard itself. As the CSA S501:14 standard is still relatively new, having only been in use since 2014, the depth of knowledge of its impacts and benefits gathered through this study was very informative. Through interviews with members of the Technical Committee, the extent of the potential user base was understood to be quite vast, going beyond engineers and architects, to include community leaders, educators, the general public, and local government. This supports the finding that as this standard is more broadly applied, the potential positive actions towards achieving the SDGs can also be expected to increase.

CSA S501:14 is primarily used to preserve existing buildings through the maintenance of the permafrost underneath those buildings. Due to the broad nature of the standard, standard users suggested that the standard may be applied not only to buildings but also to general structures that are located on top of permafrost. As this standard can be used beyond the geotechnical context, users have also employed CSA S501:14 material to educate the clients and owners they work with to help explain the science and reasoning behind the processes that they are using for a particular



project. As this standard can be applied to any type of building and structure that rests on permafrost, the impacts of using it extend to the community as a whole. Finally, since it is part of a suite of similar (NISI) standards, users mentioned that they often used the standards together with CSA S501:14 to provide more impact and clarity.

The standard is currently listed for reference within the Government of Yukon's Design Requirements and Technical Standards Document. It is also found within the Government of Canada's Climate Change Library. Most importantly, there is potential for this standard to be reviewed and considered for referencing within the NBC, a model code adopted into regulation by several provinces, territories, and municipalities across Canada, including the Yukon Territories, the Northwest Territories, and Nunavut, with some modifications and additions. Including a reference to CSA S501:14 within the NBC would allow for the standard's climate change adaptation methodology and the preservation of permafrost to be required for compliance, not just good practice. It would ensure that building design and maintenance in Northern communities would be held to a higher standard. One user noted that "higher expectations for building design would increase the short-term construction and maintenance costs, but would greatly reduce the future risk and associated cost and inconvenience of buildings becoming structurally unsound due to permafrost loss". This approach would further focus on the concept of building preservation, which is key for buildings in the North, along with maintenance activities, which, according to one of the standards users, are often lacking.



2.2 Links to the UN Sustainable Development Goals

The goal of this study is to further understand CSA S501:14 and how the use of this standard creates positive action towards achieving the SDGs, in particular SDGs 9, 11, and 13. The interview process was used to highlight potential connections with these standards through experience using the standard, as well as from personal understanding of the SDGs. Interviewing standard users revealed that there was an uneven level of understanding within the industry of what the SDGs are and what their connections are to the CSA S501:14. Although neither user's company had a commitment to the SDGs in the form of a policy at the time of the interview, one company was in the process of developing internal policies regarding the SDGs. Additionally, only one company had company-wide sustainability policy and initiatives in place that worked towards achieving the SDGs according to the standard user's knowledge of the SDGs. Nevertheless, both interviewees were able to describe direct or indirect impacts of using the standard that related to SDGs 9, 11, and 13 to some extent.

The standard users interviewed had an understanding of the connections between CSA S501:14 and the SDGs, which was also supported by the Technical Committee members' understanding of the intent of the standard. A common theme of the direct impacts of using the standard was the preservation of permafrost, an important ecosystem component in Northern Canada.

2.2.1 SDG 9 – Industry, Innovation and Infrastructure

A user noted that, "in order for infrastructure to be resilient in Northern communities, it must address issues of climate change resilience and work to preserve permafrost". Given that this describes the purpose of CSA S501:14, the link to SDG 9 and target 9.1, "*Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all*", was clear to users.

2.2.2 SDG 11 – Sustainable Cities and Communities

By preserving buildings and infrastructure, there is the creation of a resilient and adaptive community through the sustaining of economic capital and use of resources, as buildings are maintained to their full-life potential and even an extension of this life. "If properly maintained", one user stated, "a building can increase from a life capacity of twenty years to thirty". As building infrastructure in the North is incredibly technical and costly, maintaining the housing stock is critical and can allow for more livable spaces. One user noted the prevalence of overcrowding and its associated health impacts due to this high cost of building in the North that has led to a housing supply shortage. By maintaining and preserving these buildings, the standard supports both the overall SDG and, more specifically, target 11.1, which focuses on "*Ensuring access for all to adequate, safe and affordable housing and basic services*".



2.2.3 SDG 13 - Climate Action

The CSA S501:14 requirements and recommendations focusing on permafrost preservation result in climate change resilience and contribute to climate change adaptation, so while its climate link is not explicitly stated, users clearly felt that the standard directly supports SDG 13, and specifically target 13.1, *“Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries”*. One user of the standard commented that climate change and sustainability action through this standard is so inherent to the fabric of the standard that simply by implementing it, users are creating an environment that is more climate change resilient than if the standard had not been applied. This inherent value of climate change action within the standard may provide an explanation for the lack of an explicit description of climate change and resiliency implications in the text of the standard itself.

In addition, as noted above, users used this standard not only for implementation within projects but also as an education tool, which also supports target 13.3, *“Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning”*.

3 Conclusions and Next Steps

It is clear that connections to the SDGs can be made using the CSA S501:14 standard and that there are users interested in implementing the SDGs and working towards achieving them. Refining the contextual language within the standard to explicitly reflect its intended use and benefits would enable more direct connections to the SDGs to be drawn and thus clarify those connections for users and the general public. Additionally, user experiences could provide further knowledge around the unintended positive impacts of using this standard, which could be integrated into future revisions. Overall, the results of this study are positive, having identified important connections between CSA S501:14 and the SDGs, and having identified meaningful positive actions that can be implemented through the use of this standard to help achieve those goals.