CSA GROUP™

Enabling Sustainable Development through Standards

April 2022

Author

Ruben Burga, **Ph.D.,** Assistant Professor, University of Guelph

Adam Denczak, **B. Comm.,** University of Guelph

Ethan Sweeney, **M.Sc.,** University of Guelph

Emma Leckie, **B. Comm.,** University of Guelph

Laura Fallowfield, **B. Comm.,** University of Guelph

Nicole Bena, **B. Comm.,** University of Guelph

Robert Proner, **B. Comm.,** University of Guelph

Tristyn Wylie, **B. Comm.,** University of Guelph

Katie Altoft, **MBA,** Associate Dean, Niagara College

Cacey Cottrill, **B.Sc.,** Niagara College

Vraj Pathak, **B.Sc.,** Niagara College

Kernaghan Webb, **Ph.D.,** Associate Professor, Ryerson University

Advisory Panel

Ana-Maria Tomlinson, **Ph.D.,** CSA Group (Project Leader)

Michael Leering, **P.Eng.,** CSA Group

Scott Lindsay, CSA Group

Financial Support

Table of Contents

CSA GROUP™ | csagroup.org

Executive Summary

Sustainability is important in all aspects of today's society. The United Nations Sustainable Development Goals (UN SDGs) are a set of 17 aspirational environmental, social, and economic goals, as well as 169 targets, and 232 indicators that are intended to be achieved on a global-wide basis by 2030. Recognizing that the means for achieving the 17 SDGs remains open-ended, an effective way to work towards achieving the SDGs may be to integrate considerations for the SDG indicators and targets into regulations and standards, matching the technical guidance of standards with the intended measurable outcomes of the SDGs.

This report presents the findings of a research project aiming to assess how standards in general (and specifically CSA Group standards) can be used as an effective tool by organizations, governments, and policymakers in developing and implementing SDG strategies, and taking action to achieve the SDGs.

The main objectives of this project were to survey the current literature relating to linkages between standards and the SDGs; develop a robust, transparent methodology for mapping the use of standards and codes to the SDGs and validate this mapping methodology; demonstrate how standards support the SDGs through case studies; and identify existing gaps, opportunities, challenges, and recommendations to assist standards development organizations (SDOs) in optimally using standards and related instruments and activities to support progress towards achieving the UN SDGs.

csagroup.org

From the results of the research in this report, a two-stage Delphi process for mapping standards to the SDGs was developed, validated, and recommended. Although the case studies indicated a lack of awareness of the SDGs, there were clear linkages supporting the use of standards to enable outcomes linked to the SDGs.

This report identifies gaps, opportunities, challenges, and recommendations to assist CSA and other SDOs in identifying standards and related instruments and activities to support achievement of the UN SDGs in the context of the current landscape among Canadian companies, multinational professional firms, and federal SDG strategy documents. Some Canadian organizations have adopted quite sophisticated approaches towards integrating the SDGs into their overall corporate responsibility approaches, drawing on a range of standards in the process. The work of these SDG leaders could become an important resource base and the foundation for a community of practice network to share ideas and assist in integrating the SDGs into their operations.

Given the inherently collaborative, multistakeholder, and consensus-based nature of standards development, there is considerable potential for accredited standards to perform an integral role in achieving the SDGs, and for collaboration between governments and SDOs on how best to support SDG-standards activities. Internal changes in the operation of SDOs to better integrate the SDGs into current and future standards work, would be well advised. As well, SDG application by Canadian SDOs themselves and public reporting of progress being made in meeting the SDGs would be a valuable initiative.

The SDGs have emerged as an important and innovative normative instrument galvanizing governments, businesses, and civil society towards achievement of the goals. This project ultimately found that standards can provide foundational support to organizations that can assist them in meeting the SDGs. Therefore, efforts to identify and build linkages to the SDGs in existing and future standards should be viewed as a priority leading up to 2030.

1 Introduction

Sustainability is a growing priority in today's society. The term "sustainability" itself has evolved to encompass a concern that extends beyond just the environment to include societal and economic objectives on a global basis. One of the most widely used definitions for sustainability originated from the 1987 publication of *Our Common Future,* which was also known as the Brundtland Report, by the United Nations (UN) World Commission on Environment and Development. The UN defined "sustainable development" as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [1].

In line with this definition, the United Nations has been developing goals and targets for sustainability for over 20 years. Development of the UN Sustainable Development Goals (UN SDGS; or SDGs) was initiated by the establishment of the eight UN Millennium Development Goals (UN MDGs) in 2000. This initial set of goals advocated for global actions to address the needs of people and the planet in a sustainable way. These eight goals (shown in Figure 1) focused on societal challenges, reducing inequalities, and achieving sustainable development. While world leaders and member states committed to the UN MDGs and their 2015 target; the UN Secretary General at the time, Ban Ki-moon, worked with all member states to expand and strengthen the MDGs to create the UN SDGs with specific targets and measurable

national indicators; these were published in 2016 following the completion of the UN MDG period. The evolution into the UN SDGs was a momentous achievement as all 193 UN member nations committed to the goal of achieving the SDGs by 2030. The UN provided the 2030 Agenda for Sustainable Development [2], referred to as the 2030 Agenda in this report, which includes the UN SDGs and outlines the 15-year plan set out to achieve these goals.

Figure 1: The 8 UN Millennium Development Goals. Reproduced with permission from the United Nations Development Programme.

The UN SDGs are composed of 17 goals, 169 targets, and 232 indicators. Each of the SDGs (as shown in Figure 2) target specific social, economic, and environmental concerns, and, by design, it is intended that the goals inter-relate closely with one another. The UN SDGs indicators are measured at a national level and are reported regularly to the UN. The implementation of the SDGs, and the targets under each goal, is dependent on sustainability plans and policies being set by national governments and other supra-national entities such as the UN Global Compact. However, the achievement of the goals requires contributions from all stakeholders, including civil society, government, and the private sector. In Canada, governmental agencies were tasked with working with their constituent stakeholders to achieve the SDGs [3]. In particular, Employment and Social Development Canada created a Sustainable Development Goals Unit, which was tasked with developing and reporting on the national strategy to address the UN SDGs.

As an accredited national standards development organization (SDO), the Canadian Standards Association (CSA Group or CSA) has endeavoured to support the achievement of the UN SDGs through the extensive suite of standards, guidelines, and best practices being published. In early 2020, CSA Group initiated work to assess how the use of CSA standards by organizations can support the achievement of the SDGs, including underlying indicators and targets. This effort included a preliminary assessment of the connections between CSA standards and the SDGs, as well as an in-depth research initiative, the results of which are presented in this report.

Recognizing that the means for achieving the 17 SDGs remains open-ended, an effective way to work towards achieving the SDGs may be to integrate considerations for the SDG indicators and targets into regulations and standards, matching the technical guidance of standards with the intended measurable outcomes of the SDGs.

Figure 2: The 17 United Nations Sustainable Development Goals. Reproduced with permission from the United Nations (https://www.un.org/sustainabledevelopment/).

This approach could enable organizations to support the SDGs by simply complying with the requirements and recommendations of standards, whether voluntary or incorporated by reference in regulations.

This research report presents the findings of a research project aiming to assess how standards in general (and specifically CSA Group standards) can be used as an effective tool by organizations, governments, and policymakers in developing and implementing SDG strategies, and taking action to achieve the SDGs. The intent of the project was to develop tools and provide information regarding how CSA Group standards support the 17 SDGs, including details down to the target level. The project also aimed to assist in determining whether certain SDGs are not well-supported through existing standards and codes, and in highlighting possible areas for further standardization and guidance to support the implementation of the SDGs.

A preliminary mapping assessment conducted by CSA Group in 2020, suggested that a large portion of the CSA homegrown standards[1] portfolio supports the SDGs, and more specifically the targets forming the basis of the SDGs. This preliminary mapping exercise, completed by CSA Group staff, generated an initial set of mapping outcomes by correlating the objectives and requirements of standards to those of the SDGs. Building on this assessment is the observation that there is a significant opportunity to highlight the role that Canada's national standards and codes system can take to assist organizations in taking action to help achieve the 2030 Agenda, report on their actions to their partners and stakeholders, and collaborate with other like-minded organizations to further progress in this important space. Aiming to achieve the UN SDG targets through the use of standards would then contribute to the indicators that are measured at the national level and reported by the Canadian government to the UN.

Given that many laws and regulations address environmental, social, and economic impacts that fall within the scope of the SDGs, it can also be noted that standards and codes play an important role in

supporting Canada's regulatory system. A majority of CSA Group's national, binational, and trinational standards are referenced in regulations, and, in this way, many organizations across Canada are legally required to meet these standards.

Many organizations in Canada are already applying CSA standards and codes in their day-to-day operations. While the CSA Group preliminary mapping was conducted without a robust mapping method for assessing how individual standards and codes support the SDGs and the respective SDG targets, the results infer that by using CSA standards and codes many organizations are taking action to support the SDGs.

The UN SDGs are focused on the key sustainability outcomes that must be achieved by 2030, and provide the direction and framework needed to inspire action by countries and actors around the world. The UN SDGs, however, are silent on what methods and approaches may be used for achieving the suite of targets and indicators. Information regarding how standards can be used to support the SDG targets can

---

1   CSA homegrown standards here are considered to be national and binational standards developed by CSA standards committees.

help to address some of the problems posed due to the open-ended nature of the SDGs. As noted by Antonio Vives of GreenBiz (a media company devoting its blog to discussing transitions to a green economy):

> As many of the 17 SDGs and their 169 targets are very vaguely worded and cover most conceivable activity carried out by governments, companies and other institutions, they lend themselves to abuse and exaggeration. Almost anything that companies have been doing and will do can be said to contribute to the achievement of some SDGs. This is a fertile ground for greenwashing. Even though indicators are being developed, in most cases they fail to meet the basic criteria of complete, concise, controllable, measurable and understandable [4].

And here lies an example of a major opportunity posed by the SDGs for standards bodies such as CSA Group. Unlike the vague, open-ended nature of the SDGs, standards are typically granular, technical documents, for which actions can be objectively measured and benchmarked. The Standards Council of Canada defines a standard as:

> A document that provides a set of agreed-upon rules, guidelines or characteristics for activities or their results. Standards establish accepted practices, technical requirements, and terminologies for diverse fields. They can be mandatory or voluntary and are distinct from Acts, regulations and codes, although standards can be referenced in those legal instruments [5].

Thus, standards – if they assist in achieving the goals enshrined in the SDGs – can help provide the sort of "complete, concise, controllable, measurable and understandable" characteristics sought after, and could provide a robust answer to concerns about "greenwashing". However, a critical challenge associated with such aspirational global normative instruments such as the UN SDGs is the need to translate and transpose the abstract language of the goals into practical, granular guidance that decreases the likelihood of "greenwashing". Standards bodies such as CSA Group seem well positioned to provide this sort of practical, granular guidance, provided such advice is robust and defensible.

1.1 Purpose of the Research

As one of the tangible objectives of this project was to provide CSA standards users with information about

how specific CSA standards can support the 17 SDGs and their 169 targets, the following main objectives were proposed:

1. Survey the current literature to understand any existing processes being used to provide reliable linkages between standards and the SDGs.

2. Develop a robust, transparent methodology for mapping the use of standards and codes to the SDGs and validate this mapping methodology (using preliminary SDG mapping results for a subset of CSA Group homegrown standards).

3. Develop relevant "case studies" demonstrating how standards support the SDGs. NOTE: The case studies for SDG standards research developed as part of this research effort have been published separately.

4. Identify gaps, opportunities, challenges, and recommendations to assist CSA Group and other SDOs in optimally using standards and related instruments and activities to support Canadian organizations in achieving the UN SDGs as part of the 2030 Agenda.

1.2 Understanding the Nature of the UN SDGs

As noted above, the UN SDGs were developed and agreed to in 2015 as part of the 2030 Agenda for Sustainable Development, following on from the UN MDGs, whose 15-year life span ended that same year. While the SDGs represent key components in a United Nations sustainable development agenda for 2030, the likelihood is that they in turn will also be superseded by a new set of goals. Therefore, it is important to keep in mind that efforts to integrate the SDGs into current standards and law frameworks should be viewed not as ultimate outcomes to be reached but as parts of an ongoing, evolving process, with the destination not being achievement of the SDGs but the ongoing world efforts to decrease poverty and inequality, improve health and environmental conditions, encourage and increase prosperity, and secure peace around the world.

Given that the United Nations is an intergovernmental body, and that nations agreed to the SDGs via the United Nations General Assembly, it is governments (not companies or other organizations) that are the

actors directly charged with the responsibility for developing strategies for achieving the goals and measuring and reporting on progress pursuant to the SDG framework of goals, targets, and indicators. Thus, the SDGs can be described as "state centric". As the headings in the preamble to the SDGs makes clear, the key SDG themes are "people", "planet", "prosperity", "peace", and "partnerships". One organization has suggested that SDGs 1 to 6 are focused on "people", SDGs 7 to 11 share a "prosperity" theme, SDGs 12 to 15 concentrates on "planet", while SDG 16 concerns "peace" and SDG 17 is devoted to "partnerships" [6].

While the SDGs are created by governments, and governments have the primary responsibilities associated with implementation and reporting, there is overlap with the increasing preoccupation of businesses with "ESG" (environment, social, and governance). The difference between the SDGs and ESG is that ESG is focused on business, with investors in particular seeking information on which environmental and social issues firms are choosing to address, and on whether the firms have in place the governance capability to address those environmental and social issues. The SDGs, on the other hand, represent an intergovernmental consensus concerning critical societal goals to be met by 2030, and as such businesses are starting to draw on them to assist in determining which environmental and social issues they can contribute to and support through their commercial activities. This can involve assessments by each firm of their unique priorities and operating circumstances, how those priorities and operating circumstances overlap with the SDGs, and an analysis as to whether a particular sustainable development goal, target, or indicator is relevant from a company and investor standpoint ("material") to the ongoing profitability of the firm. Thus, the SDGs can be seen as an indication of societal priorities to be achieved by 2030, whereas ESG is a business "frame" intended to assist businesses focus their attention on their key environmental and social impacts, priorities, and techniques for addressing those environmental and social impacts and priorities. The SDGs can assist businesses in conducting their ESG work.

The SDGs are aspirational and outcome-oriented in nature, and, in that regard, are different from international treaties developed under the auspices of the UN. Treaties are international laws that delineate acceptable from unacceptable behaviour, and that are binding on countries that have consented to, ratified, and implemented the treaties. For example, the UN Convention Against Bribery sets out prohibitions against bribery that are then reflected in national laws, such as the *Corruption of Foreign Public Officials Act* (CFPOA), which makes it an offence under Canadian law to give, offer, or agree to "advantages or benefits" to a foreign public official. The SDGs are different from other UN normative instruments such as the *UN Guiding Principles on Business and Human Rights,* or the *United Nations Global Compact,* which are in essence stipulations of ways of behaving. For example, pursuant to the *UN Guiding Principles on Business and Human Rights,* businesses are to respect human rights by (among other things) putting in place due diligence processes to identify risks and decrease the likelihood of those risks occurring.

The UN SDGs are different from both UN international treaties, on the one hand, and UN principles instruments such as the *UN Guiding Principles on Business and Human Rights,* on the other hand, because the SDGs do not stipulate the conduct that is required or desired (or the conduct that is prohibited).

Instead, the SDGs articulate outcomes (e.g., "zero hunger") to be achieved by 2030 but leave unstated the modalities for achieving those outcomes. In other words, the UN SDGs have an open architecture in terms of operationalization: the UN SDGs start from the proposition that there are many ways in which the goals can be achieved, and there are important contributions that can be made towards achievement of the goals by governments, the private sector, and civil society. The SDG targets and indicators represent a more detailed framework for determining, measuring, and reporting on whether the goals have been met, but as with the goals, the targets and indicators do not articulate how the goals should be met. As one report notes, "… the SDGs do not represent an additional set of requirements or norms for companies to follow. Rather, the SDGs provide a framework through which companies can demonstrate, via their integration and reporting activities, that they are managing the full range of … economic, environmental, social and governance issues in a responsible manner" [7].

1.3 The Structure of the UN SDGs: Goals, Targets, and Indicators

The UN SDGs framework is centred on 17 goals, 169 targets, and 232 indicators. The SDG indicators were developed by the UN so that reporting on the indicators could be done at a national level and reported by the individual national agency using agreed-upon measures. It was recognized that, although the goals do provide guidance towards sustainability and social developments, previous experience with the UN MDGs showed that material commitments were needed to make meaningful changes to society. Consequently, the UN SDGs are structured differently than the UN MDGs.

A UN SDG could be perceived as being accomplished through a particular action that is not actually described or measured through the targets and indicators.

For example, SDG 1 aims to "End poverty in all its form everywhere" [2]. This is an aspirational goal. However, intending to do an action described by the wording of a goal does not necessarily contribute to the targets or indicators defining that goal. For SDG 1, there are seven targets with one to three indicators per target. The first target, SDG 1.1, states: "By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day" [2].

The need for specificity was recognized by the working group assigned to create the indicators for the UN SDGs: The Open Working Group (OWG) of the Sustainable Development Solution Network [8]. For SDG 1.1, the indicator 1.1.1 therefore states the requirement to measure the "Proportion of population below the international poverty line, by sex, age, employment status and geographical location" [2]. In this way, the UN SDGs provide a measurement method through the design of indicators that would allow multilevel processing of the metrics (national, global, regional, and thematic monitoring).

These metrics could be aligned with business goals. As the OWG states, "businesses will need to play a critical role in achieving many SDGs ... For this reason, it is critical that business metrics be closely aligned with the SDGs and the underlying framework" [8]. The goals described by the SDG are aspirational in nature and it would be easy for businesses to map almost any activity or standard to many SDGs. However,

the targets and indicators that define the SDGs are more specific. The indicators measure whether a systemic action that addresses the SDG targets can be measured. A direct measurement of the indicator shows a clear link to accomplishing an SDG.

1.4 Structure of the Report

The remainder of this report is structured as follows:

- Section 2 discusses the methodology used to achieve the objectives in this project.

- Section 3 analyzes the results obtained from applying the developed mapping methodology to a sample of CSA standards.

- Section 4 presents a review and discussion of how leading Canadian organizations are working to help achieve the SDGs based on national and global rankings, examines learnings gathered from federal SDG strategy documents, and further discusses the research outcomes of this project. It then presents a series of gaps and opportunities for using accredited standards to support SDG activities, and provides a series of recommendations for standards development organizations, government bodies, standards users, and standards developers.

- Section 5 provides a conclusion tying together the key project outcomes.

2 Methods

2.1 Overview of Methods

The activities described in this section served as an essential part of the wider research initiative presented in this project: to identify current gaps in knowledge and approaches for supporting the UN SDGs 2030 Agenda.

The following methods were used to achieve the objectives of the research project.

1. A systematic literature review was conducted to see if any methodologies linking standards to SDG indicators existed. No suitable methods were found available.

2. A robust Initial Mapping Methodology was created with the intent of identifying connections between standards and the SDG indicators to understand how specific standards can be used to help achieve and work towards the SDGs.

3. A validation exercise was conducted on the mapping results that examined the robustness and replicability of the developed mapping methodology.

4. An analysis was done of the role standards and SDOs can play in supporting public and private sector organizations in achieving the SDGs, as well as identifying associated gaps and opportunities, based on a review of the nature and structure of the SDGs, federal government strategy documents, information shared by private sector companies regarding their SDG strategies and actions, and the mapping methodology and validation research outcomes.

5. Finally, a set of recommendations was developed based on the results of the research initiative.

The methodological processes and activities were supplemented by case studies that could describe linkages between standards and the realization of the SDGs. During case study development, standards users were interviewed and presented with mapping results and asked for their opinion on the identified correlations.

2.2 Literature Review

The purpose of the literature review was to understand what has been done in the academic and public domains to "map" standards to the SDGs, or vice versa. Linking standards to the SDGs aims to provide an accountable way of showing that an organization applying a specific standard (which is connected to one or more SDG) is therefore contributing to the achievement of the SDGs. A review was done of academic and non-academic sources. Research databases that were used for academic sources included EBSCO, OMNI, Web of Science, and Google Scholar. Non-academic sources (frequently referred as "grey" literature) were found through Google and by targeting specific relevant websites such as the UN website and standards agencies. The search involved a variety of search terms and combinations of terms revolving around the central question of how standards may have been mapped to the SDGs. The list below provides some of the search terms used alone or in combination with each other:

- Sustainable development goals; SDG; Millennium development goals

- Mapping, tracking, measuring, impact
- Standards, norms, business, policies

After an initial search of each database was complete, publication abstracts were reviewed for relevancy to the study. If the literature related to some type of discussion around mechanisms or systems to map SDGs to standards or standards to the SDGs, then the article was selected for a deeper review. It is important to note that articles that only linked a standard or standards to an SDG without providing some type of mapping were not selected for in-depth review. All articles that appeared relevant were thematically grouped and were carefully examined.

The results of the literature review and research informed the next stage of the research process: creating a robust mapping methodology.

2.3 Initial Mapping Methodology

2.3.1 Background and Approach

To link standards to the SDGs, it was important to develop and utilize a methodology that would link the measurable indicators underlying the broader goals to the standards. In keeping with this philosophy, the mapping methodology developed in this research used the indicators and the outcomes or processes that defined the indicators as a base for the creation of a UN SDG Reference Dictionary (see sample of reference dictionary in Appendix B) used in the mapping of standards. Finding a link with the indicators would directly link to an outcome that is then mapped through the targets to the UN SDGs. So, in this way, the standards would directly contribute to the SDGs.

A robust and detailed methodology was developed for assessing the link between standards and the SDGs. The methodology outlined is intended to help determine whether a documented standard can be used to support the specific SDG target(s). This mapping methodology can be used with existing CSA standards and with any other standards bodies and can map standards to SDGs. The methodology was developed in a robust and defensible manner so that users would be assured that the implementation of specific standards within their organization was supporting the mapped specific SDG(s). Achieving SDG targets can be measured, more specifically,

through achievement of their corresponding SDG indicators, so how standards could link to the details of the indicators and targets by analyzing the metadata descriptions that make up those indicators (SDG indicator documents) was explored. Figure 3 provides an overview of the process development used in creating and testing the mapping methodology.

Figure 3: Overview of the Process Development

Development on UN SDG Reference Dictionary based on UN documentation and qualitative research practices.

Development of initial mapping methodology to link standards and SDGs.

Mapping validation: human analysis and evaluation of key terms and linkages resulting from mapping methodology.
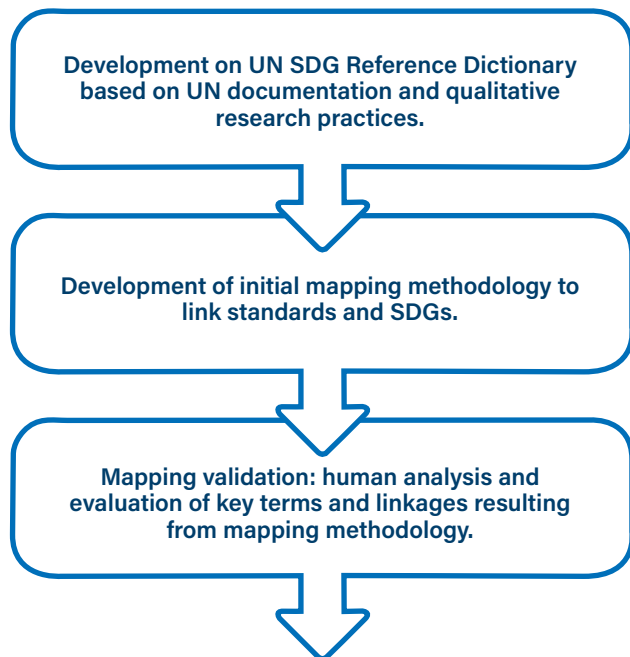
2.3.2 Development of the SDG Reference Dictionary

The SDGs and their indicators are largely outcome-based as that is recognized as a fundamental way of achieving required SDG targets [8]. Therefore, an important task is to find a way to match the language and expressions (processes and outcomes) of the SDG indicators to the technical language used within standards. To find appropriate correlations, a qualitative content analysis was conducted on the metadata descriptions underlying the indicators. The objective was to create a SDG Reference Dictionary that would serve as a tool for comparing specific language used in the SDG indicators to match semantically against language described in the CSA standards. The outcomes or processes that define the SDG indicators in addition to the stated goals and targets were extracted from the

SDG indicator documents, and this makes up the SDG Reference Dictionary. The SDG Reference Dictionary can be used to compare SDG indicators to that of CSA standards documents. The SDG Reference Dictionary was created as described below.

1. Relevant phrases were extracted and coded that were either process or outcome oriented from the E-Handbook on the Sustainable Goals Indicators [9] (the meta-indicator document provided through the UN [10] was used as this is the most current representation of the indicators, their measurement methods, and the intent behind the documents). This extraction and coding process was done using a free online coding tool, CATMA6 (https://catma.de/). Other content analysis tools such as Nvivo or Wordstat could also have been used.

2. The passages that were extracted from the indicator documents and coded related to either a process or an outcome. Each of the 231 SDG metadata indicator documents available to the researchers were coded.

3. Coded passages were checked for correlation and inter-rater reliability.

4. Up to five correlated passages were extracted from each indicator metadata file and pasted into a key Microsoft Excel document containing the UN wording for the SDGs, for their targets, and for their indicators.

5. This Excel document is what will be referred to as the SDG Reference Dictionary (example shown in Appendix B) and can be used to compare standards documents to the UN SDGs.

2.3.3 Development of the Initial Mapping Methodology

A procedure has been created to compare and map standards to the SDGs, using the SDG Reference Dictionary. The first step in the mapping process is to create the SDG Reference Dictionary. Next is to assess the standard being mapped and identify key phrases or wording within the standard, specifically key phrases and wording that relate to a process and/or outcome that is the focus of the standard. Then, the key terms identified from assessing the standard is compared to the SDG Reference Dictionary which contains the key terms extracted from the SDG indicator documents.

Lastly, the standard is run through the UN LinkedSDG tool to identify linkages between the standard and SDGs, which allows a comparison of all results to be made with human judgement and evaluation. The complete and detailed mapping procedure, which will be referred to in this report to as the Initial Mapping Methodology, is shown in Appendix C.

In essence, the mapping procedure starts at the indicator level to identify a *direct impact* on the metrics used to measure the SDG. The matching of meanings and intentions of a standards' process/outcome code to the indicator/indicator open codes is considered a direct match and implies that the standard, due to this match, has a direct relationship and can have a measurable impact on the particular SDG. As the literature review suggests, the impact on the SDGs may be an indirect result of using the standards rather than a direct impact. In the Initial Mapping Methodology, if a match between standards content and the SDG indicators is not found, then the mapping should progress hierarchically through the targets and then the goals to indicate the *indirect impact* that results. Standard content or phrases that match only at the target level are considered to be indirect matches and the standard will address the spirit of the SDG at the target level but will not contribute towards a measurable impact of the SDG at the target level. The process requires a Delphi method[2] of analysis as the

matching of content cannot be completed without the interpretation of the meaning of the target or indicator codes and phrases to the meaning of relevant standards wording. It may be possible to automate the comparison and analysis process using artificial intelligence, however this exploration is beyond the scope of this report.

Initial pilot testing with CSA standards identified that the introductory sections of the "Introduction" and "Scope" are sufficient to explore the reliability of the mapping exercise. The remaining operational sections found within the body of a standard are often highly technical and can be difficult to interpret correctly with regards to their relevance and impact on the SDGs. As a result, the Initial Mapping Methodology focuses on the use of the Introduction and Scope sections for several of the analysis and comparison stages.

2.4 Mapping Validation

A validation exercise was conducted to determine whether the mapping methodology developed in Section 2.3 is effective and efficient at identifying linkages between CSA standards and the SDGs. Using the mapping methodology developed, the validation activity applied the methodology to reassess the SDG linkages for a subset of CSA standards that had previously been mapped by CSA staff.

---

2   See the glossary in Appendix A for a description of the Delphi method.

The validation exercise was conducted by a second, independent group of researchers, (different from the researchers who developed the mapping procedure). This second and independent group of researchers aimed to ascertain the effectiveness, accuracy, and practicality of the mapping methodology developed and/or to potentially corroborate the results of the CSA preliminary mapping assessment. A selection of 50 standards were chosen to be used as the basis for the validation exercise. The selection of these 50 standards aimed to include:

- Standards representative across the main sectors in which CSA operates;

- Standards that mapped to many SDGs as well as standards that mapped to few or none; and

- Standards published after 2015 (and available in a format supported by the UN LinkedSDG tool).

- National and international adoptions of standards were excluded from the validation exercise.

The mapping validation had two main objectives:

- To assess the methodology proposed and determine its effectiveness and efficiency and propose any changes or improvements.

- To determine whether the SDG linkages previously identified through CSA's preliminary mapping efforts were replicable and could be validated using the mapping methodology.

The results of the mapping validation exercise, as well as the Revised Mapping Methodology developed based on the validation results, are presented and discussed in Section 3.3.

2.5 Case Studies

Concurrently with the validation exercise in Section 2.3, researchers were engaged in obtaining qualitative information regarding the relationship between the use of standards and the effect on the SDGs. These case studies were developed for the purposes of exploring the understanding by users of CSA standards in the context of the SDGs. Standards were chosen using the lens of relevance and perceived importance to sustainability:

- CSA S478:19 Durability in Buildings

- CSA W200-18 Design of Bioretention Systems

- CSA C22.1:21 Canadian Electrical Code Part 1

- CSA Z662:19 Oil and Gas Pipeline Systems

- CSA S501:14 Moderating the Effects of Permafrost in Existing Building Foundations

- CSA S503:20 Community Drainage System Planning, Design, and Maintenance in Northern Communities

- CSA/ANSI B149.6:20 Code for Digester Gas, Landfill Gas, and Biogas Generation and Utilization

In total, eight case studies were developed to better understand how the application of particular standards led to positive impacts in line with the SDGs (two case studies were completed for CSA S503). The interviews were conducted with users and developers of the standards. Interview participants who were involved in the development of the standards were interviewed to gain a greater understanding of the standards themselves. The case studies focused on specific CSA standards and the interviews were conducted with industry experts or professionals to gain a better understanding of how these specific standards were related to the SDGs in practice.

The case studies that were developed will be briefly summarized in the next sections.

3 Mapping Methodology Development and Validation Results

3.1 Literature Review

The research related to mapping methods found hundreds of academic papers and discussion papers relating to theoretical frameworks, literature exploring the impact of SDGs, and literature measuring the direct or indirect effect of SDGs, but few specific methods to map standards to indicator levels of measurements. See Table 1 for a summary of the literature review.

In the available research published before August 2020, no academic papers were found that described a robust mapping methodology that linked standards directly to the indicators and thus to a direct impact on the targets and SDGs. However, the following mind map (Figure 4) illustrates the themes of the articles that were selected for review. Researchers found themes specifically oriented towards standards and the SDGs

Table 1: Summary of the Literature Review

Databases	No. of articles (resulting from multiple searches – total is the sum of all articles resulting from multiple searches of terms or expressions)	Filtering for academic literature by reviewing abstracts (note that only the first 100 articles that were deemed relevant by the database search engine were manually reviewed)	No. of articles that were reviewed thoroughly
OMNI	1,402	Duplications were eliminated	6
EBSCO	13,614	Duplications were eliminated	19
Web of Science	1,143	Duplications were eliminated	13
Google Scholar	72,600+	Duplications were eliminated	15
Grey literature (obtained through targeted searches in relevant websites such as the UN)		Filtering was done as each source was explored	10
Total Articles			**63**

(9 articles); themes describing the framework of the SDGs in relation to standards (12 articles); themes oriented towards reporting linkages between the standards and the SDGs (23 articles); and themes exploring the relationship between standards and the SDGs or Millennium Goals (19 articles). A list of the articles is included in Appendix D.

Some research has been done to link standards to the targets of the goals (see Appendix D for literature linking linkages to the standards), but there was little guidance from the academic literature on a rigorous mapping process.

In the non-academic literature review, few sources provided guidance to a reliable mapping technique linked directly to the SDGs. The exception was the UN itself as it provided a semantic textual comparison tool, the UN LinkedSDG tool (http://linkedsdg.apps. officialstatistics.org/#/), to compare text files to relevant passages in the UN SDGs. By using this tool, which is linked to UN documents, a user can upload a textual file; the tool is based on a content comparison algorithm and can provide guidance as to which SDG and targets most closely match the text of the submitted file. This tool provides guidance on possible matchings for SDGs and encourages the user to reflect on the meaning of their submitted text in relation to the meaning of the SDG target.

3.3 Mapping Methodology Validation Results

The objective of this part of the project was to test the efficiency and efficacy of the mapping methodology developed, and propose any changes or improvements required. The validation exercise used the results of 50 CSA standards that had been mapped to SDGs by CSA project managers to evaluate the SDG linkages and to ascertain the effectiveness and practicality of the mapping methodology and/or to potentially corroborate the results of the CSA project manager assessment.

According to the Initial Mapping Methodology developed in Section 2.3, the UN LinkedSDG tool was used to map the 50 standards to the SDGs to test the viability of this mapping method and compare it to the SDG Reference Dictionary mapping methodology as well as the CSA preliminary mapping assessment.

3.3.1 SDG Reference Dictionary Mapping Results

The SDG Reference Dictionary mapping procedure was created to simplify the mapping process and make it consistent across multiple users. Continuous use of this tool did create some familiarity; however, it did not simplify the process or create reliable consistency. The technical language of the standards made it difficult to find connections with the SDG Reference Dictionary,

Figure 4: Mind Map Illustrating the Themes of the Articles Selected for Review
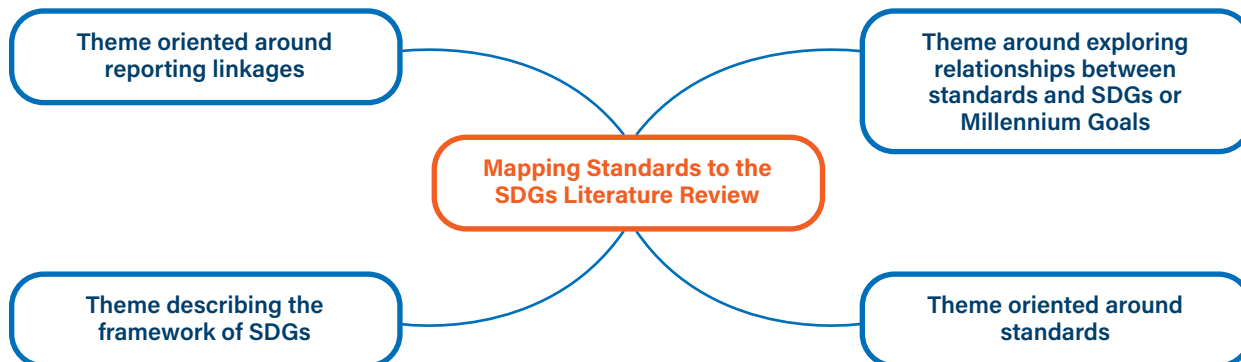
as well as create phrases to extract from the standards. The connections identified by CSA Group standard staff during their own preliminary mapping assessment was based on expert opinion. Standards staff were likely familiar with the standard content and had a good understanding of the standard subject matter and were able to interpret the technical language of the standard to some extent in order to identify connections to the SDGs. The researchers completing the mapping validation exercise were less familiar with the standards content, therefore the challenge of matching the technical language of the standard to the SDG Reference Dictionary was more significant.

Key results taken from the validation exercise pertaining to the use of the SDG Reference Dictionary approach included:

- For the most part using the SDG Reference Dictionary to map the standards to the SDGs at the indicator level was not successful.

- Extracting relevant phrases from the Introduction and Scope sections of the standards was difficult for standards with a Scope section of less than half a page in length:
  - Over half (54%) of the standards used for the validation exercise have a Scope section of less than half a page, which is a contributing factor to why identifying phrases from the standards to create matches within the SDG Reference Dictionary was difficult.

- It was more difficult to find matches to the indicator level versus the target level, and only 44% of the standards mapped had at least one relevant match identified at the indicator level.

Using the SDG Reference Dictionary tool, it was however very easy to find matches to the SDG target level, especially for certain categories of standards. For 74% of the standards included in the validation exercise, it was possible to identify at least one relevant match to the target level of a SDG. Phrases that typically resulted in the most matching success included:

- Climate change
- Climate change adaptation
- Risk
- Human health
- Resilience
- Infrastructure
- Wastewater
- Fuel
- Electricity
- Safety
- Hazardous waste
- Energy efficiency
- Renewable energy
- Air pollution
- Disaster
- Adverse impacts
- Retrofit

The SDG Reference Dictionary was able to identify inconsistent connections to some standards. However, it was able to identify three standards with connections to all SDGs which were also identified previously by

CSA. There were also standards for which connections to the SDG Reference Dictionary could not be found, which typically included standards related to pipeline systems or the oil and gas sector, those related to equipment for occupational health and safety, and guidelines for certain products within the construction and infrastructure sector. Hence the contribution to the SDGs by those standards were indirect and could be considered as second-order effects.

3.3.2 UN LinkedSDG Tool Validation Results

Overall, the UN LinkedSDG tool was faster to apply than the SDG Reference Dictionary. While the connections produced by this UN tool were useful, the tool tended to overestimate the number of connections to an SDG when mapping standards with longer Scope sections. The longer the Scope section of the standard was, the greater the number of concepts it identified with increasing irrelevancy. Most of the standards mapped contained a short Scope section (half a page or less) and this created the opposite problem to the one previously described. The UN LinkedSDG tool would find fewer connections for standards with shorter Scope sections.

Nevertheless, the UN LinkedSDG tool was able to find at least one match that correlated well with the linkages identified in the CSA preliminary mapping exercise for 27 of the 50 standards mapped, and for 16 of those it was able to identify more than one. Furthermore, for eight of the standards mapped with the UN LinkedSDG tool, it was possible to identify connections to all the goals and targets identified through the CSA preliminary mapping exercise. Overall, the UN LinkedSDG tool was useful in finding relevant connections when mapping standards to the SDGs; however, the quality and quantity of connections found varied because of the variance in the standards' Scope section length. As a result, the tool can be used as a supplement, but it should not be considered a replacement mapping method.

3.3.3 Validation Exercise Reflections

At present, there is no suitable replacement method for the mapping of standards done by CSA subject matter experts as part of the preliminary mapping effort. The SDG Reference Dictionary does prove to be valuable in situations where the CSA preliminary

mapping has not identified any linkages between standards to any SDGs, but connections have been identified using the SDG Reference Dictionary. In this way, this tool can act as a safety net for the manual mapping conducted by subject matter experts at CSA. The SDG Reference Dictionary cannot act as a standalone tool at present because of the inconsistency in phrase matching that both overestimates and underestimates connections in different scenarios. Use of the SDG Reference Dictionary can also miss connections if the general concept or purpose of the standard is not directly stated in the Scope.

The SDG Reference Dictionary has been developed in order to simplify the mapping process and create consistency across multiple users; however, this tool does not contribute to a quicker process or greater reliability in mapping standards to SDGs.

The UN LinkedSDG tool has proven to be effective and efficient at identifying connections but has the problem of overestimating or underestimating the number of connections based on the length of the Scope and the type of information included.

The major difficulty in creating consistency for the results between the standards was due to the difference in how the standards were formatted and written, specifically within their Introduction and Scope sections. Some standards did not include an Introduction (Section 0.0) and only included a Scope (Section 1.0), while others included both. Furthermore, standards that included both varied in that some standards included more contextual information in Sections 0.0 and 1.0, and the length of Section 1.0 between standards tended to vary significantly. As a result of some of the efficacy issues found in this validation exercise, it is recommended that future mapping be done using a combination of the methods used in this project – a "hybrid" methodology. This revised mapping methodology, incorporating use of both tools, would ensure greater effectiveness for mapping standards to the SDGs as all the methods could work collectively to eliminate any shortcomings pertaining to the use of any individual mapping tool.

3.3.4 Recommendations and Revised Mapping Methodology

Based on the analysis of the validation exercise results and a synthesis of the findings captured in Sections 3.3.1, 3.3.2, and 3.3.3, several recommendations can be made regarding both the structure of the standards and the methodology for mapping. Although the preliminary mapping exercise undertaken by CSA Group involved a large amount of human judgement, took a large amount of time to complete, and was intensive, it was effective, and there are no clear options to radically transform this procedure. A more automated procedure may work more efficiently if the standards were more consistent in structure and involved transferable language. Below is a starting list of recommendations regarding the standards' structure and the standards' mapping process.

Overarching Recommendations:

1. Create a Standard Style Guide to ensure consistency in the Scope and Introduction sections of standards:

   ▪ Identify that all standards must have a Section 0.0 and Section 1.0.

   ▪ Propose the type of information that must be included in Sections 0.0 and 1.0, including any examples of section headers that can be used (specifically related to context and issue resolution).

   ▪ Suggest a length range for these sections, where there is a minimum amount of information needed to be included, as well as a potential maximum.

   ▪ Clearly identify processes and outcomes from the use of the standard through these sections; put together language to be used based on each SDG so that connections between the standard and the SDGs are easy to identify.

   ▪ Consider including context in the Introduction or Scope sections about the SDGs as well as how that standard explicitly promotes specific goals at the target and/or indicator level.

2. Ensure that those reviewing the standards or performing the mapping methodology for a particular set of standards are well versed in the subject matter. Consideration should be given to general training for standards developers and standards staff on the SDGs and the use of standards as a tool for achieving them, as context for their standards development process. The mapping work should be conducted by a group or subgroup of the Technical Committee developing the standard and standards staff.

3. When making connections between the SDGs and the standard, focus is often on the direct and most obvious outcome of the standard or the subject matter, as it should be. However, consideration should also be given to the indirect impacts of the standard that can help promote the SDGs. For example, a standard that works with infrastructure and permafrost has an obvious or direct connection to Climate Change (SDG 13) and Infrastructure (SDG 9) goals, however, there is also the less obvious connection of preserving health systems, ensuring housing stock, and contributing to the sustainable consumption of resources.

Mapping Methodology:

A revised procedure is recommended using the following double or two-stage Delphi method to enhance reliability of the mapping process and results:

1. Standards staff (directly responsible for supporting the development of a specific standard) review the intent and scope of a standard manually in consultation with Technical Committee members and include a one- or two-sentence justification for linkages that are not obvious or described in the Scope section.

2. A separate group of trained staff are provided with the relevant parts of the standard's document and any additional guidance from step 1 and go through a Delphi process of phrase and intent matching using the SDG Reference Dictionary and the UN LinkedSDG tool. (Staff would be trained in the terminology and intents of the SDGs as described through the targets and indicators in the SDG Reference Dictionary):

   a. Use the UN LinkedSDG tool for initial phrase matching and highlight any discrepancies for discussion with the Technical Committee.

   b. Use the SDG Reference Dictionary as a Delphi guide to the intent of the indicators and targets for the SDGs by phrase matching (focusing on intent of phrases) and highlight any discrepancies for discussion with the Technical Committee.

   c. Compare the results of "a" and "b" and identify and justify discrepancies.

3. Results are provided to the Technical Committee members for final evaluation and approval for release.

The complete, revised Mapping Methodology is provided in Appendix E.

3.4 Case Studies Results

Eight case studies were conducted in an effort to better understand how the application of particular standards has led to measurable positive impacts in line with the SDGs. The case studies focused on providing corroborating viewpoints related to the SDG linkages in certain standards. Ultimately, case studies concerning infrastructure resilience in Canada's North, oil and gas pipeline safety, durability of building, and green infrastructure for stormwater management were all used to corroborate the value of these CSA standards in terms of their provision of practical operationalization guidance concerning a variety of SDGs.

The case studies also provided the observation that government officials currently are not required to identify and make express SDG linkages in laws that reference standards, even though interviewed officials acknowledged the alignment of various SDGs in the laws and standards they were working on.

Furthermore, it was found in some cases that users of particular standards may not have been aware of or even concerned about a standard having linkages to the SDGs. The reasoning behind this is based on the fact that if adopting a standard is required by law, then the usage of the standard would not depend on or be influenced by its connections to supporting SDGs. While the SDG linkages may not be of primary concern to the immediate standards user in some cases, especially regarding standards referenced by law, the SDG linkages to a particular standard can be of use to multiple stakeholders such as investors, lenders, governments, communities, consumers, non-governmental organizations (NGOs), and supply chain partners.

These findings highlight and support one of the recommendations outlined later in this report, which is for standards development organizations to develop a systematic method for identifying and labelling the SDG linkages in standards, including those incorporated by reference in the law, in recognition of the fact that such explicit linking may be of value to not only the users of standards but also to the stakeholders and partners of standards users. This recommendation, among others, will be explored further in the next section of this report.

4 Standards and the UN SDGs: Gaps, Opportunities, Challenges, and Recommendations

4.1 Overview

In order to understand and identify the gaps and opportunities related to the use of standards to support the implementation of the SDGs, it's useful to first consider a broad overview of the goals. Such an approach, presented in the sections that follow, provides a deeper understanding of their unique nature and how standards and SDOs can be utilized to pursue the achievement of the goals.

Further research into Canadian companies, multinational professional firms, and federal SDG strategy documents as they relate to the SDGs was also conducted to gain a deeper understanding of the current landscape and to see how these different types

of entities interact with and support the SDGs. Lastly, the work completed in Sections 2 and 3 of this report is reviewed to identify further insights that can be gained from the preliminary mapping exercise, mapping methodology, mapping methodology validation, and case studies.

4.2 Opportunities, Challenges, and Recommendations in the Context of the SDGs

4.2.1 The Role of Standards in the Context of the SDGs

At a fundamental level, an analysis of the gaps, opportunities, and recommendations associated with the role of CSA Group and other SDOs in supporting the achievement of the SDGs rests on understanding the distinct and innovative nature of the SDGs as a global normative instrument, and the unique role standards can play in meeting these goals. The distinctive characteristics of the UN SDGs have significant implications for standards bodies such as CSA Group, but before discussing the specific implications for standards, the broader implications need to be reviewed.

First, by establishing goals but not constraining actors in terms of exactly what should be done to achieve the goals, the UN SDGs have had the effect of unleashing the energies and imagination of diverse actors of all kinds to join the effort. It is a "let all flowers bloom" approach, and it has galvanized widespread interest that is not normally associated with UN initiatives.

Second, with all 193 UN member nations from around the world coming together to create high-level goals for achievement within a particular time period, the UN has created an opportunity for the alignment of diverse state and non-state forces so that they are all pointing in the same direction at the same time. There is arguably a much greater likelihood of any global goal being achieved if all actors around the world are striving towards the same goal through multiple approaches at the same time, and a form of

synergy can occur across diverse state and non-state actors in this situation, as opposed to a dissipation of energies that can occur when all actors are not pointing in the same direction [11]. There is growing evidence that this "galvanization" of multistakeholder actors is occurring, as reflected, for example, on a UN SDGs website which (as of May 2, 2021) itemizes in a banner heading that "3051 Events, 1297 Publications and 5424 Actions"[3] [12] have taken place to further the achievement of the goals. More concretely, the latest KMPG report (2020) on sustainability reporting ("The Time Has Come") states that "[a] significant majority of companies (68% of the N100 and 72% of the G250) now connect their corporate reporting to the SDGs" [13]. This multistakeholder galvanization is also arguably reflected in the title and contents of the 2021 publication from the Government of Canada that pertains to the *SDGs – Moving Forward Together: Canada's 2030 Agenda National Strategy* [14].

We will refer here to the phenomenon by which diverse actors from around the world are rallying around a single set of agreed-upon global goals, instead of dissipating the cumulative effectiveness of their actions through conduct that is not at all pointed towards the achievement of a specific aim, as the "North Star effect". The North Star has been used since ancient times as a visible, common point of reference for peoples no matter where they are located around the world, guiding those who follow it towards a particular destination.

But it is also important to recognize the significant limitations of an open-ended, outcome-oriented approach to public policy that does not stipulate how the work is to be achieved, such as that embodied in the UN SDGs. For example, KPMG notes that "SDG reporting is often unbalanced and disconnected from business goals" and that "[o]nly 14% of N100 companies report both positive and negative contributions to the SDGs" [13].

Commentators have noted that the effectiveness of standards in supporting SDG objectives depends on factors such as the robustness of verification procedures and the level of stakeholder engagement,

---

3   These numbers were noted on May 2, 2021. They are updated frequently. It is not clear to the authors how the UN has defined and therefore what qualifies as "events", "publications", and "actions." Nor is the UN's methodology for collection made clear, and neither is it possible to access the database that presumably underlies this statement. The listing is being mentioned here simply to support the general observation that a "let all flowers bloom" phenomenon seems to have been unleashed by the publication of the UN SDGs.

as well as the implementation context, such as the existence of a supportive public policy environment [15]. While ISO and CSA standards are voluntary until adopted into regulation, they are developed through an accredited process with balanced stakeholder representation and transparency requirements [16]. The accredited standard development process is a robust and rigorous process which involves public consultation and the achievement of consensus from a diverse group of experts in the field. As a result, accredited national standards have an accessibility and legitimacy that non-accredited standards may lack. Recognizing this value, the Canadian government has referenced many CSA national standards in regulations, supporting the uptake of best practice within standards.

The second key characteristic of standards that aligns well and in a complementary way with the UN SDGs, and the law, is that standards are often practical, detailed methods of operationalization for businesses and other organizations. These standards are often designed to address a variety of environmental, social, and economic (ESE) organizational risks as well as beyond-organization societal risks, with requisite precision in language and with correspondence or connection to particular ESE-related goals [15]. In effect, these standards provide the sort of information that is likely to be sought after by organizations genuinely looking for assistance on how to move from goals to action, and by those monitoring organizations and seeking assurance that organizations are on a pathway to the effective implementation of SDGs and not just professed support for the goals. [4] By adopting SDGs that are aligned with ESE-related practices that have been codified in standards, businesses and other organizations can realize cost efficiencies and reduce risk in ways sought after by their investors and other stakeholders. In this regard, third-party verification of compliance with standards represents one way in which organizations can provide some assurance to external stakeholders that they are not only talking the talk, but also walking the walk.

In effect, accredited standards such as those of CSA Group can potentially form a bridge to connect the aspirational goals enshrined in the SDGs at the global level; the prohibitions, restrictions, and other requirements found in law at the national and subnational level; and the day-to-day world in which organizations operate as they interact with other stakeholders and the environment. [5] The role for actors such as CSA Group that can perform this bridging function, bringing diverse actors together to develop innovative, practical solutions, is arguably implicit in comments such as this from *Moving Forward Together* document referred to earlier, which states, "By working with key partners and stakeholders, the SDG Unit seeks to raise awareness of the 2030 Agenda. It also supports new partnerships and fosters innovation to drive progress on SDGs" [14].

In effect, accredited standards can contribute to a stronger governance ecosystem to support implementation of the SDGs. But while many existing and future CSA standards referenced in legislation are or could be important complementary SDG regulatory bridging instruments for organizations, as described above, and assuming the standards are properly applied by organizations, there is another challenge that needs to be addressed. This challenge revolves around the fact that the UN SDGs have been layered after the fact on top of a body of existing legislation and existing standards. Given that neither the existing laws nor the standards were specifically and explicitly developed with the UN SDGs in mind, the connection or alignment with the specifically formulated wording of SDGs is not self-evident from the wording of many of the laws and standards. It is not that such a connection cannot be made; rather, neither the government officials creating the existing laws nor the standards developers negotiating the existing standards were tasked to expressly make such a connection.

There is evidence from other research prepared for this project that, when pressed to make such a connection to the SDGs, law makers or standards development experts might very well be able to make such connections.

---

4   The sort of stakeholder that is seeking confidence that organizations are capable of making real progress towards the achievement of the goals, such as through application of standards, includes: governments, investors, lenders, insurers, communities, NGOs, consumers, and workers.

5   The multifaceted state/non-state bridging capabilities of standards is discussed in considerable detail in Webb [21], [22].

4.2.2 Standards Gaps and Opportunities

The concepts discussed in Section 4.1 lead to the identification of several gaps, opportunities, and recommendations. First, in terms of a gap, currently, to the best of the knowledge of the authors, neither government officials nor those involved in the development of standards that are not government officials have to this point been required to consider and make explicit how the laws and standards they are developing are addressing the SDGs. The associated opportunity is to fill this gap by making such SDG consideration and explicit reference to SDGs an obligation. Four recommendations are suggested, of which the first three address future standards and laws and the fourth addresses existing ones.

1. The first recommendation is that standards development organizations (SDOs) such as CSA Group develop policies to this effect at their earliest convenience for all standards and related instruments that they develop.

2. A second recommendation is that government (all levels), SDOs in the private sector, and civil society adopt a similar directive.

3. A third recommendation is that SDOs such as CSA Group establish cross-sectoral internal committees specifically to develop the directive and to oversee the directive's implementation.

4. A fourth recommendation is that a similar and related set of actions be undertaken with respect to the existing body of laws and standards. In this regard, a prioritization exercise should be undertaken so that those existing instruments with the most significance in terms of impact be assessed first.

With respect to new laws and standards, it would be possible, and it may be desirable, to literally include the SDG-related language within the laws and standards (e.g., in either the Introduction or Scope section of the law or standard). With respect to existing laws and standards, a "labelling" document that is associated with, but not part of the actual instrument in question, could provide the intended value of signalling the SDG connection in the instrument to users without necessitating a formal amendment or revision of the instrument in question, at least on a provisional basis.

At the CSA level, in terms of carrying out the actual work of SDG "labelling" of existing standards and other instruments, based on the initial experience of CSA in mapping possible connections of CSA standards to the SDGs, and of the work of the partners for this project, what has emerged is a robust double-Delphi mapping and validation process as presented in Section 3.3.4. The first Delphi process (mapping) is that process undertaken by CSA staff responsible for the standards in their portfolio (as has been done via the preliminary

mapping effort). The second Delphi process would be undertaken by a central CSA group using various validation tools (including the SDG Reference Dictionary, and the UN LinkedSDG tool), who could corroborate or revise the initial findings of the CSA staff, and (in collaboration with others) develop the actual wording for the SDG labelling. For new publications, CSA project managers would work with the Technical Committee in question to identify relevant SDGs, and the central CSA group could then corroborate/verify the correctness of the initial SDG assessment.

An additional and more general recommendation is that CSA establish an external SDG advisory committee, consisting of a mix of individuals from government, the private sector, and civil society who have experience with the SDGs. Among other things, the external SDG advisory committee can act as a sounding board and a check and balance concerning the decisions of the internal CSA SDG committee.

In summary, because of the unique, open-ended, outcome-oriented nature of the goals, and because of the high profile of the UN as the pinnacle intergovernmental body in setting global goals, the UN SDGs have galvanized action and interest from the public, private, and civil society sectors around the world. As such, a powerful "North Star" phenomenon seems to be in effect, bringing together diverse actors to work towards the achievement of the goals according to their abilities. However, a critical challenge associated with such aspirational global normative instruments such as the UN SDGs is the need to translate and transpose the abstract language of the goals into practical, granular guidance that decreases the likelihood of "greenwashing". Standards bodies such as CSA Group seem well positioned to provide this sort of practical, granular guidance. However, because the existing body of laws and standards was not developed specifically with the UN SDGs in mind, a challenge that lies ahead is in "SDG labelling" of the existing body of laws and standards,

and on a forward basis, ensuring that all new laws and standards are so labelled.

There are several related opportunities and associated recommendations that flow from this initial analysis (e.g., with respect to standards, plus documents and training) that will be summarized at the end of this section. The next subsections address learning opportunities resulting from this research project.

4.3 Learning from Use of SDGs by Canadian Companies

To better understand how SDOs can assist Canadian organizations in drawing on the SDGs as part of their operational activities, a sample of the SDG-related communications of selected Canadian companies considered to be sustainability leaders was reviewed[6]. The identification of which Canadian companies constitute sustainability leaders was done in two ways:

- Reviewing the sustainability reports of Canadian companies listed in the "Global 100" ranking of the world's most sustainable companies, undertaken by Corporate Knights (Section 4.3.1).

- Reviewing the SDG activities of Canadian organizations that submitted reports of their SDG activities for the Global Compact Network Canada Canadian SDG Accelerators Awards[7] [17] (Section 4.3.2).

The identification of Canadian sustainability leaders and results from these two methods will be discussed below.

4.3.1 Learning from Canadian Firms on the Corporate Knights Global 100 Ranking

A review was conducted focusing on the sustainability reports of Canadian companies listed in the "Global 100" ranking of the world's most sustainable companies, undertaken by Corporate Knights [18]. The review provides preliminary insights into the range of

---

6   It should be kept in mind that a desk analysis of SDG-related communications of companies may or may not reflect actual practices of these companies. This is an inherent limitation of a content analysis of this type.

7   In the interests of full disclosure, it should be noted that one of the authors (K. Webb) of this report was on the external judging panel for the 2020 awards (that are the subject of discussion in this report). It should also be noted that the Global Compact Network Canada (GCNC) independently developed the evaluative criteria and made an initial screening of the applicants to shortlist ten applications for the external judges' review. Thus, the author did not participate in the development of the evaluative criteria or weighting system. Based on the evaluative criteria and weighting system provided by the GCNC, the external judges then provided the GCNC with their assessments of the final ten, and the GCNC then reviewed these assessments and on that basis the GCNC (not the external judges) selected the final winners. Thus, the author did not participate in the development of the evaluative criteria, the selection of the shortlist, or the winners, all of which was done by the GCNC.

SDGs that selected Canadian companies are choosing to refer to in their sustainability reports, and how they are choosing to use them.

According to the 2021 ranking [18], 13 Canadian companies were listed within the top 100: Stantec Inc., Canadian National Railway Co., Cascades, Inc., IGM Financial Inc., Transcontinental Inc., Bank of Montreal, Telus Corp, Cogeco Communications Inc., Sun Life Financial Inc., Agnico Eagle Mines Ltd., Canadian Solar Inc., Teck Resources Ltd., and Canadian Tire Corporation Ltd. Eight of the 13 top 100 companies participate in standards development activities through CSA Group Technical Committees. Stantec Inc. was the top Canadian company listed (position 5 out of 100) and Canadian Tire Ltd. was the lowest Canadian company listed (position 99 out of 100).

The ranked Canadian companies operate in eight different sectors[8], and with the exception of one company, all have published sustainability reports since 2018[9]. Of the 12 companies that have published sustainability reports since 2018, two did not make any reference to the SDGs[10]. In the sustainability reports of two other ranked Canadian sustainability leaders, the companies indicated an intention to engage with the SDGs but provided no details[11]. A summary of the results of the rudimentary quantitative analysis of SDG usage of the companies undertaken for this report is provided in Appendix F.

The very basic review conducted here revealed some potentially important observations from the standpoint of a standards development organization such as CSA Group. It starts with the fact that 11 of the 12 ranked companies that have published sustainability reports since 2018 chose to make references to the SDGs in

their reports – indicative of the degree of penetration of SDGs into the world of Canadian sustainability leaders. It is also worth noting that of the 13 ranked companies, three are from the financial sector, two are from the telecommunications sector, and two are from the mining sector.

In terms of the most referred SDGs among all 13 companies, SDG 5 and SDG 13 were referred to by seven companies; SDG 3 and SDG 8 were referred to by five companies; SDG 4, SDG 7, and SDG 11 were referred to by four companies; and SDG 1, SDG 6, SDG 9, SDG 12, and SDG 15 were referred to by three companies. Each of the 17 SDGs were referred to by at least one company.

In terms of number and diversity of SDGs mentioned in sustainability reports by individual companies, two of the 13 Canadian sustainability leaders referred to more than ten of the SDGs in their reports (Stantec: 11; BMO: 13) and made extensive reference to them in their reports (43 SDG references by Stantec, and 53 SDG references by BMO)[12].

Looking at the references to ISO or CSA standards by all of the ranked companies in their sustainability reports, there were only 14 references made: ISO 14001 was mentioned by four, ISO 14064 was mentioned by two, ISO 27001 was mentioned by two, and each of the other standards were only mentioned once. The three CSA standards referred to were CSA Z-1003 (Psychological Health and Safety), the ISO/CSA work on sustainable finance (ISO TC 322 and Canadian Mirror Committee), and one CSA standard pertaining to health care and cleaning (under development)[13]. While keeping in mind the small sample size, this may suggest that the Canadian Global 100 sustainability

---

8   The eight sectors are financial (BMO, IGM Financial, and Sun Life Financial), telecommunications (Telus and Cogeco), mining (Agnico Eagle and Teck Resources), transportation, forestry, packaging, engineering, energy, and retail.

9   Note that Cascades has not published a sustainability report since 2009. The author (K. Webb) cautions against drawing any negative inferences about the company based on this fact, as each company has a choice about what it will report on its sustainability performance

10   This report conducted only a rudimentary assessment of SDG references in the sustainability reports of the listed Canadian Global 100 companies. A more comprehensive evaluation of all company communications could reveal additional references to SDGs. The author (K. Webb) cautions against drawing any negative inferences about any of the listed companies based on whether or how companies are referring to the SDGs. The analysis here is simply to provide some indication of the prevalence of references to SDGs in Canadian companies considered to be sustainability leaders.

11   Canadian Solar and Agnico Eagle.

12   Among the other Canadian ranked sustainability leaders, Teck Resources referred to 8 different SDGs in their report, Transcontinental referred to 7, while four companies (IGM Financial, Sun Life, CNR, and Telus) referred to 5 SDGs.

13   It should be noted that in the sustainability reports of the ranked sustainability leaders, in addition to the references to ISO and CSA standards, there was also considerable mention of non-ISO and non-CSA standards.

leaders are not aware of the possible linkages between the SDGs and standards such as those of ISO and CSA, or that they do not consider such standards to be of particular value to their operations and performance, or that they do not perceive there to be particular value to mentioning them in their sustainability reports (i.e., that mention of the standards would not carry any particular weight with external stakeholders that are monitoring company sustainability reports and performance).

Further exploration of this type concerning possible explanations for the paucity of references to accredited standards could be of considerable value. It could assist in understanding how communications about the connections between their standards and the SDGs should be approached and what possible additional products could be developed (e.g., plus documents on how to use particular standards from an SDG standpoint). It could also assist in understanding the importance of those standards to meeting SDG goals and targets, on training services that could be provided, and on related work such as speaker events.

SDOs currently have significant gaps in knowledge about the SDGs and how they are being used by Canadian companies. There is a real opportunity for SDOs to learn and benefit from a more comprehensive and in-depth version of the rudimentary analysis undertaken above concerning SDG usage by Canadian companies. Canadian sustainability leaders such as those identified through this preliminary analysis are well positioned to see the value of, and could be champions for, strategic use of standards in combination with their existing SDG actions. More detailed analysis of a larger pool of companies concerning usage of standards in connection with SDG actions could assist SDOs in identifying a group of "standards SDG leaders" who could be approached by SDOs for further work.

4.3.2 Learning from the Global Compact Network Canada Canadian SDG Accelerators Awards Winners

This section reviews the SDG activities of Canadian businesses and other organizations that submitted reports of their SDG activities for the Global Compact Network Canada Canadian SDG Accelerators Awards [17] that are given annually by the GCNC. For the

purposes of the awards, companies were to select a particular SDG to focus on and describe their activities associated with that particular SDG. This review allows for a better understanding of how leading Canadian businesses and other organizations have chosen to intensively address a particular SDG.

For 2020, the Canadian SDG Accelerators Awards were divided into large companies, small and medium-sized enterprises (SMEs), and non-businesses [17]. There were 12 candidates in the large companies category (for which 3 winners were selected), 8 were in the SMEs category (for which 2 winners were selected), and 6 were in the non-business category (for which one was selected). Appendix G includes a listing of all the candidate companies in all three categories, as well as their selected SDGs and related targets.

Looking first at the totality of large and small businesses and non-businesses that submitted SDG packages as part of the GCNC competition, of the 26 submissions, certain SDGs more than others were more commonly selected as a focus. Most notably, SDG 3 – Good Health and Well-Being was selected by four large businesses and one non-business; SDG 12 – Responsible Consumption and Production was selected as a focus goal by three large businesses and one non-business; and SDG 17 – Partnerships for the Goals was selected by two SMEs and one non-business. Beyond these three SDGs, no other SDG was selected as a focus by more than two contestant organizations, and six SDGs were not selected at all. While bearing in mind the small sample size, it is interesting to note that SDG 3 and SDG 12 were the most commonly selected SDGs of large businesses (six of 12), SDG 17 was the most commonly selected SDG among SMEs (two of eight), SDG 6 – Clean Water was the most commonly selected SDG among non-businesses (two of six), and SDG 17 was selected by an organization from each of the large business, SME, and non-business categories. Because of the small sample size, it is important not to put too much weight on this SDG distribution, but at the same time, a sorting process of this type is potentially useful in identifying which SDGs are of interest to Canadian organizations, which could be priority areas for attention.

SDOs might find it valuable in the future to conduct further research concerning the needs and interests

specifically of SMEs and non-businesses, and devise different, more focused SDG guidance (e.g., concerning new or existing standards, or training) for these categories of organizations, since the GCNC experience suggests a different focus of SDG attention of these organizations when compared with large businesses. A second potentially important insight (to be confirmed by further research) is that certain SDGs might be of common interest across a broad cross-section of organizations, and so given this cross-sectoral interest, certain SDGs might be deserving of particular attention in terms of guidance provided by SDOs. Third, examining the details of the GCNC winners in each category provides insights into the type of SDG information that leading sustainability-oriented Canadian organizations provide about their association with the SDGs that they have chosen to focus on.

4.4 Learning from the Multinational Professional Services/Accounting/ Consulting Firms

Earlier in this discussion, it was noted that the SDGs have had a galvanizing "North Star" effect, stimulating action from a wide variety of actors around the world. Large multinational professional services/accounting/ consulting firms such as KPMG, PWC, and Deloitte (and others) have undertaken considerable research and published a wide number of reports concerning the SDGs and given the global scope and magnitude of their operations, there are aspects of this work that is of potential value to SDOs. Three of the products provided by KPMG, PWC, and Deloitte are discussed in this section. These products identify gaps and opportunities and ultimately make recommendations when looking at the relationship between the SDGs, SDOs, and these multinational firms.

KPMG has been conducting sustainability reporting surveys since 1993, publishing its eleventh edition in 2020 [13]. KPMG research indicates that a majority of companies now connect their business activities with the SDGs in their corporate reporting, but SDG reporting is often unbalanced and disconnected from business goals. A significant challenge is for companies to move from simply making reference to the SDGs to demonstrating that they have in place the processes and practices capable of meaningfully making progress

towards achieving the goals and targets associated with the SDGs – the type of processes and practices codified in many accredited standards [13]. This is a gap and an opportunity. The first step is the type of labelling exercise discussed in this report that assists organizations in understanding the linkages between the SDGs and accredited standards. The second step, suggested here, is forming alliances and connections with those stakeholders that are attempting to measure real progress by companies in meeting the SDGs (e.g., investors), since they are in a good position (given their financial connection to many businesses) to drive companies to move beyond platitudes about the SDGs. In Canada, a powerful group of eight leading pension fund CEOs have emerged as champions for better sustainability reporting by Canadian firms [19]. It is recommended that SDOs work with entities such as these major Canadian pension funds to understand their interests and needs and to assist them in understanding how accredited standards can assist them in ensuring that companies are capable of meeting identified SDGs.

The PWC SDG Selector [6] is an online tool that assists businesses in determining which SDGs are likely to have an impact based on the sector they are in, which SDGs are likely to have the greatest potential opportunity, and which SDGs are important in particular geographic locations. The tool is based on surveys PWC has undertaken with business leaders, as well as 200 data sources that PWC has access to. The SDG Selector is not tailored to the particular needs and situations of Canadian businesses and other organizations and is not based on or derived from or designed to address linkages between SDGs and standards. But it does assist in addressing a knowledge gap, which is understanding the particular set of SDGs likely to be particularly important to particular businesses and sectors in Canada [6].

As noted earlier in the discussion of the GCNC SDG Accelerated Awards, there is a significant knowledge gap between the SMEs and their association with the SDGs. The Danish SDG Accelerator Project for SMEs [20] is a United Nations Development Programme (UNDP) aiming to accelerate business solutions with the SDGs. The SDG Accelerator Project is unique because the program combines UNDP's insights into the challenges embedded in the SDGs, with

intelligence from carefully selected experts, as well as facilitation and advisory competence from Monitor Deloitte, the commissioned consultancy group in Denmark. The Danish Deloitte research is particularly insightful concerning the work of SMEs in relation to the SDGs through review of case studies of ten SMEs involved in the development of innovative sustainability products and services, which are associated with SDGs 2, 4, 7, 9, 12, and 14. Review of the case studies can assist in understanding the distinctive ways that smaller businesses can align their work with the SDGs, and in turn gain insights into how standards can support SDG activity among SMEs.

4.5 Learning from Federal SDG Strategy Documents

As observed at the outset of this report, the UN SDGs are an intergovernmental instrument, and as such the primary responsibility for the implementation of the goals rests with the government. In Canada, that responsibility is being carried out by the Sustainable Development Goals Unit (SDGU) within Employment and Social Development Canada (ESDC). Given the broad and ambitious scope of the 17 SDGs and related targets and indicators, as well as its whole of society vision, ESDC's SDGU has a challenging (and exciting) responsibility. The most recent indication of how the SDGU is intending to carry out this responsibility takes the form of the February 2021 document, *Moving Forward Together: Canada's 2030 Agenda National Strategy* [14]. The document makes a point of emphasizing how success will depend on collaboration among all levels of government, First Nations peoples, civil society (both organizations and individuals), the private sector, academia, and international partners.

While the national standards system (NSS), Standards Council of Canada, and SDOs are not mentioned in the *Moving Forward* document, they play an integral role in meeting the SDG goals set forth in the document. In fact, the structured, transparent, consensus-based, multistakeholder process of standards development, which is at the core of the NSS, is arguably ideally suited for achievement of the SDGs. Indeed, many of the standards that fall within the remit of CSA Group (e.g., pertaining to the Electrical Code, and maintenance and operation of nuclear and oil and gas facilities, meeting environmental and health
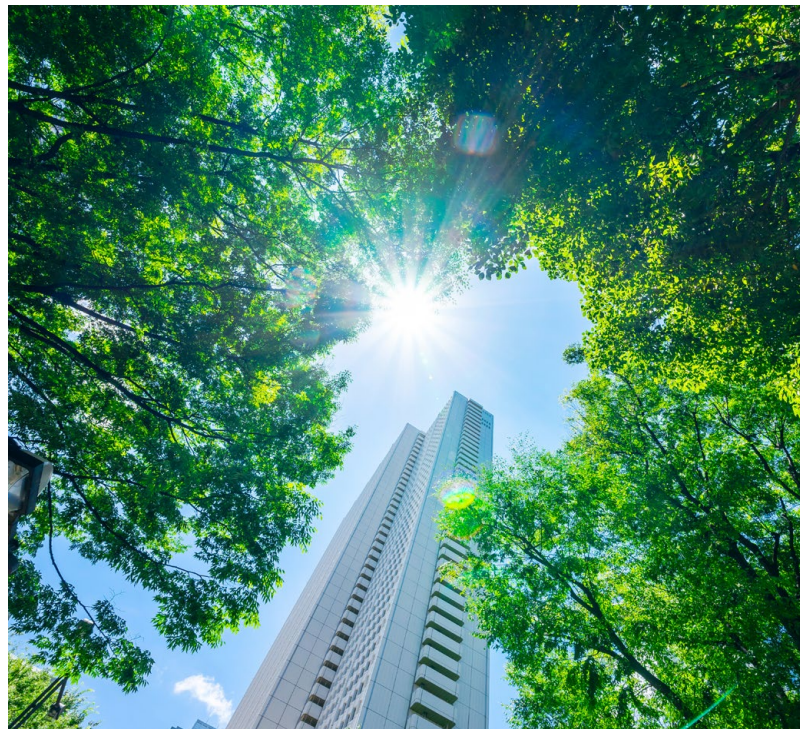
and safety requirements) are shining examples of multistakeholder cooperation, involving a cross-section of the very actors referred to in the ESDC SDGU's call for multistakeholder collaboration.

The suggestion made here is that SDOs such as CSA Group can work with the federal government (e.g., ESDC SDGU, SCC, and many federal departments currently participating in and sponsoring the development of CSA and other NSS standards) to highlight the many ways that SDOs and other components of the NSS are already contributing to the achievement of the SDGs, and as an integral part of the enabling environment mentioned in the *Moving Forward* document, can assist in meeting newly identified SDG opportunities. As noted earlier in the report, the role played by existing laws, regulations, and standards in meeting the SDGs is not readily apparent. In addition to the recommended action of "labelling" the SDG aspects of accredited standards, the suggestion made here is that the federal government should undertake a similar "SDG labelling" effort for its laws and regulations. A harmonized and consistent approach between governments and standards bodies to such labelling would be optimally beneficial for all parties concerned. Also, as mentioned earlier,

a conference on the role of standards in meeting the SDGs, co-sponsored by the federal and other governments, the CSA and other SDOs, and other stakeholders would be an excellent way of increasing awareness of the collaborative, constructive, and effective way in which the standards system operates.

4.6 Learning from CSA Group's SDG Preliminary Mapping Exercise, Mapping Methodology, Methodology Validation Exercise, and Case Studies

For the purposes of this report, the CSA Group's SDG preliminary mapping exercise conducted in 2020 provided a good indication of the possible linkages between the existing CSA standards and the SDGs. This in itself is an important initial insight because it supports the overall conclusion that CSA Group and its standards can provide important assistance to users of CSA standards concerning how their activities, when complying with the relevant CSA standards, can align with and promote the achievement of the SDGs.

A key challenge that lies ahead revolves around how this standards-SDG linkage is communicated. In this regard, the suggested "labelling" process discussed as well as the suggestions for conferences, training, plus products, and so on should all play important roles. A related challenge involves persuading the standards users of the value of aligning their activities specifically with the SDGs, and the value of communicating to their stakeholders how the standards they are using support the achievement of the SDGs.

For the purposes of the analysis of CSA Group's preliminary SDG mapping exercise that was undertaken, composite aggregate analysis graphics were created. Figure 5 is a pie chart showing the number and percentage of CSA standards mapped across the seven CSA sectors. It can be seen that many of the current CSA homegrown standards are in four sectors: electrical (40%), gas products (19%), construction and infrastructure (16%), and health and safety (14%). Together, these four sectors comprise 89% of the CSA standards that were mapped.

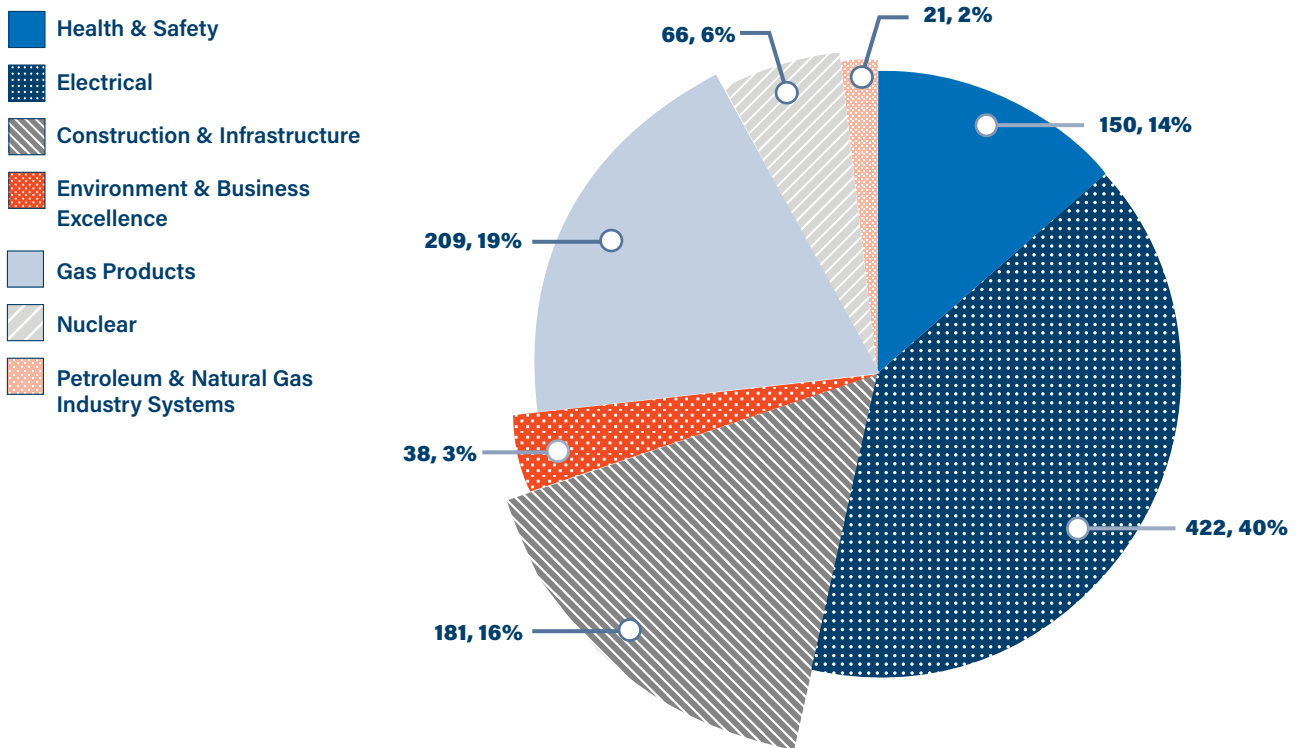**Figure 5:** Number and Percentages of CSA Standards Mapped by CSA Sector

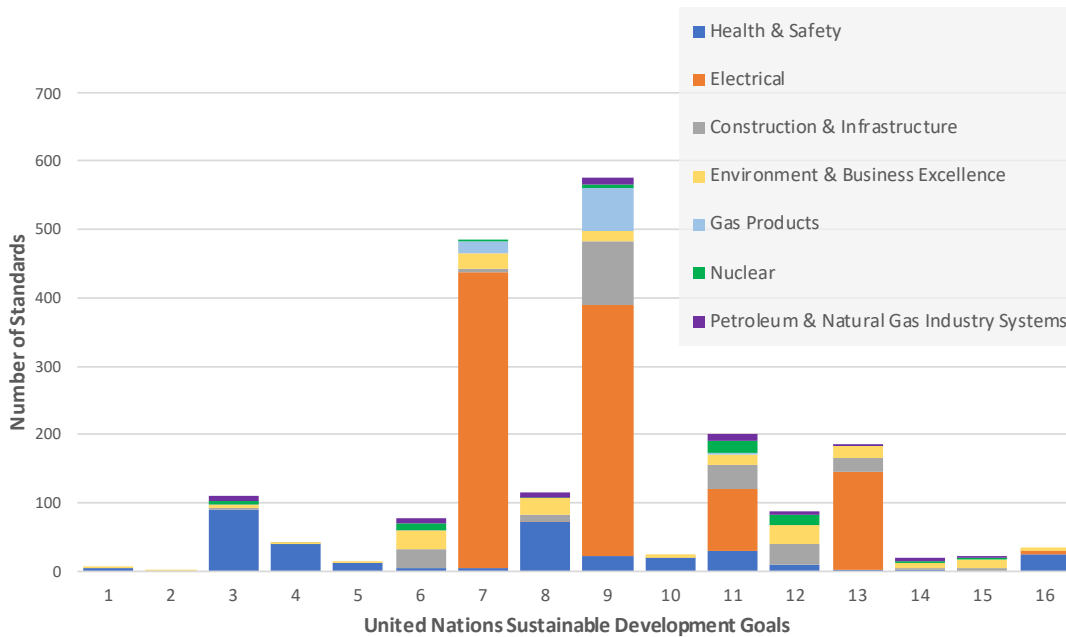**Figure 6:** Number of Standards Mapped per UN SDG.

Figure 6 is a visual breakdown in the form of column graphs of which SDGs are most commonly linked to which CSA sector standards[14]. This provides another layer of insight concerning the work of CSA Group and how it supports the SDGs. Based on the above analysis, it is perhaps not surprising that SDG 9 – Industry, Innovation and Infrastructure was found to have the most linkages to CSA standards (575 of the 1,107 assessed standards), followed by significant SDG linkages between the assessed CSA standards and SDG 7 – Affordable and Clean Energy, for which 484 standards were identified. As well, SDG 11 – Sustainable Cities and Communities and SDG 13 – Climate Action were found to be linked to many CSA standards through the mapping exercise.

What emerges from the analysis as shown in Figure 6 is the proposition that it may be beneficial to consider linkages between standards and the aforementioned SDGs. Further work at both the target and indicator level may reveal more granular information on the exact ways in which the identified standards link to the four SDGs. Ultimately, this work could lead to many different new products, including guides on the ways in which identified standards support the SDGs, seminars on these connections, and training. Analysis of Figure 6 data also suggests that for certain sectors, linkages to other SDGs predominates. For example, for CSA Group's occupational health and safety sector, there are strong linkages to SDG 3 – Good Health and Well-Being. The environmental dimensions of SDGs 6, 11, 12, and 13, as reflected in CSA standards from several sectors, lead to the observation that the development of guides, seminars, and training on how CSA standards support linkages to various environmentally oriented SDGs could be beneficial. With respect to other SDGs, such as SDGs 1, 2, 5, 10, 14, 15, and 16, CSA should review the possibility for increased work on the topics associated with those SDGs. It is, however, understood that some of the SDGs may simply be ones for which CSA or other SDOs are not well positioned to develop SDG-linked standards. The CSA Group's SDG mapping exercise has been and is likely to continue to be helpful to CSA in identifying where it is best positioned to prioritize its SDG-related work.

---

14   While linkages were also found between CSA standards and SDG 17 – Partnerships to Achieve the Goals, for which 448 standards were identified, and given that all accredited standards support the World Trade Organization's principles, **all** such standards by definition are forms of partnerships to achieve the goals and no further mapping discussion concerning SDG 17 will be undertaken for this project.

Flowing from the discussion up to this point in the report, two examples of new possible standards or "plus product" projects that CSA could undertake could be:

▪ A "plus product" or standard concerning how organizations can report on CSA standard-SDG linkages associated with their operations; and

▪ A standard or guide on how to develop and implement effective partnerships.

As was evident from the examination of the GCNC SDG Accelerators Awards, there are considerable opportunities for partnerships among organizations to achieve particular SDGs. While such a standard could have immediate application in the context of the SDGs, it could also have application beyond the SDG context.

Given that many organizations are currently applying CSA standards that have been identified as supportive of one or more of the SDGs (indeed, as we have seen, many are required to apply the standards referenced in legislation, this leads to the conclusion that many organizations may be supporting the SDGs via their use of CSA standards without being aware of the link to the SDGs. If these organizations were aware of the SDG connection, they might wish to communicate this feature to their stakeholders and other interested parties. Beyond the set of organizations that are currently using SDG-supportive CSA standards, there is another set of organizations that are currently not using SDG-supportive CSA standards. Perhaps they would be incentivized to use these CSA standards if they knew that doing so could contribute to meeting the SDGs and their indicators, or if they believed that communication of this SDG linkage would matter to their stakeholders. This speaks to the value of having in place a communications strategy that can promote both the value of the SDGs and how the implementation of identified CSA standards can support the achievement of the SDGs.

In the interest of ensuring that CSA Group communicates reliable and accurate information concerning CSA-SDG linkages, and in the interest of reducing the potential for variable interpretations of CSA-SDG linkages as assessed from one set of CSA sector managers to another, the mapping methodology developed and described in Section 2 was intended to map standards to SDGs and to corroborate the results of the internal CSA exercise or better perform such assessments. Such a methodology could be provided to other organizations interested in performing similar reviews of their standards or other documents. Following the validation exercise, the resulting hybrid methodology or two-stage Delphi process presented in Section 3.3.4 has been found to be workable and could be adopted on an ongoing basis. Given that the majority of CSA national, binational, and trinational standards are referenced in regulations, the suggestion made here is that priority should be given to assessing these mandatory standards over those which are voluntary.

The case studies discussed in Section 3 were developed in an effort to better understand how the application of particular standards has led to measurable positive impacts in line with the SDGs. As alluded to earlier in this report, the case studies provided corroboration of SDG linkages in certain standards. The case studies provide corroboration for the value of CSA standards in terms of their provision of practical operationalization guidance concerning a variety of SDGs. One observation from one of the case studies indicated that standards users may not be aware of or interested in whether a standard has linkages to any SDGs, especially when a standard is referenced in legislation. It was noted that while particular standards users may not have an immediate interest in how a standard supports specific SDGs, it can be important to a broader range of stakeholders that may include investors, lenders, governments, communities, consumers, NGOs, and supply chain partners. Therefore, as noted earlier, it is recommended that CSA develop a systematic method for identifying and labelling the SDG linkages in standards, including those referenced in law, in recognition of the fact that such explicit linking may be of value to not only the users of standards but also the stakeholders and partners of standards users.

4.7 Final Recommendations

In this section, the recommendations and suggestions provided throughout Section 4 are summarized. There are no assumptions of priority or importance attached to the sequence of recommendations.

Table 2: Recommendations for Accredited SDOs Operating in Canada[15]

Theme	Recommendations	Justification
Coordination of Internal SDG Efforts	▪ Consider establishing a cross-sectoral **internal SDG committee** to coordinate internal SDG mapping activity and to develop SDO-wide SDG focus. ▪ Consider establishing a cross-sectoral **external SDG leadership advisory committee** with members, including representatives of organizations that are already using standards and are also making efforts to use SDGs in sophisticated ways, as well as other stakeholders showing SDG leadership.	▪ The internal committee could assist in ensuring a consistent approach to use of the SDGs (e.g., with respect to labelling; with respect to wording; with respect to interpretation of the SDGs; with respect to prioritizing which new standards and other initiatives such as plus products and conferences and training/orientation activities that the SDO wishes to develop, with the training/orientation activities being developed for SDO staff, for users, and for standards development volunteers). ▪ The external SDG leadership advisory committee would provide important input into the work undertaken by the internal SDG committee, and also play a key "outreach" role for the current and future SDO standards community and beyond.
Engagement, Education, and Communications	▪ Consider offering to work in a **pilot testing** capacity with organizations that are already users of its standards (across several different sectors) and that express interest in exploring how SDGs could or do apply to their operations, in conjunction with their use of the SDO standards. ▪ Consider conducting a **survey of standards users** regarding their current knowledge and use of SDGs, their interest in SDGs, and where they think value-added new standards and related services regarding the SDGs are needed. ▪ Consider holding a **conference** on how standards can support SDG work of governments, the private sector, and civil society. ▪ Consider working with a university or universities to create a **speaker series** that would allow a broad set of stakeholders to learn more about the SDGs and the important role played by standards in meeting the SDGs.	▪ Pilot testing could form the basis for case studies on the value of organizations using standards and SDGs, and for possible development of SDG training services, as well as to assist in identifying SDG-related gaps in existing standards, and to identify new opportunities for SDG supportive standards. ▪ A survey could also be useful in raising the profile of the SDGs among current users of the SDO standards and provide the SDO with valuable intelligence concerning SDG-related gaps and opportunities. ▪ A conference would serve to showcase the significant role that standards bodies can and do play in support of the SDGs, due to the collaborative, multistakeholder, consensus-based, structured nature of standards development. It would also assist in identifying SDG-related gaps and opportunities. ▪ Universities are often perceived as "neutral learning forums" allowing stakeholders with a variety of different perspectives to meet and discuss issues in a spirt of constructive engagement.

---

15 It is recognized that the scope, size, focus, resources, interest in the SDGs, and other factors vary considerably from one accredited SDO to another. For this reason, the appropriateness and applicability of each of these recommendations to each particular SDO is likely to vary, from one to the other.

Theme	Recommendations	Justification
Labelling of Standards	▪ Consider having a **formal policy** in place whereby all standards should be assessed and "labelled" in terms of the SDG linkages. In line with this, consider undertaking an **SDG "labelling exercise"** concerning new and existing standards, indicating the SDG connections pertaining to each standard. ▪ Consider creating a **searchable database** of the SDO standards and corresponding SDG connections.	▪ Among other things, the CSA preliminary mapping exercise has served to identify the value of including a statement in the Introduction or the Scope section of the standards that identifies to readers how the standards can assist in meeting broad policy-oriented goals of the type included in the SDGs. In terms of carrying out the actual labelling work, the suggestion is made here that a sequential, double-Delphi process should be adopted, drawing on the robust mapping and validation process developed as part of this project. ▪ A common approach to labelling among all Canadian "rule makers" would be optimally valuable for the wide variety of entities that draw on or are subject to the rules of these different actors.
New Standards Work	▪ Consider exploring the value of **developing new standards or guides** in support of the SDGs. Prioritize SDG work on the sectors and subject issues that most existing standards are focused on, and focus on the SDGs found to be most closely linked to those standards.	▪ Analysis undertaken for this report reveals that each SDO has a distinctive concentration of standards pertaining to particular sectors and subject matters, and associated with that, a distinctive pattern of linkages to particular SDGs.
Collaborations with Key Stakeholders	▪ Consider developing **collaborations with sustainability organizations** that either are or could be promoting the SDGs and forming alliances and connections with those stakeholders that are attempting to measure real progress by companies in meeting the SDGs.	▪ Such collaborations could allow for useful information sharing and could broaden SDO networks on SDG and other issues. Given their interest and knowledge on this topic, key stakeholders such as investors are in a good position to motivate companies to move beyond platitudes about the SDGs.
Support for Research	▪ Consider establishing a dedicated and specialized **SDG research** fund to stimulate further exploration of standards-related SDG work.	▪ In a comparatively low-cost way, such a fund could substantially enhance understanding on diverse issues.
Collaborations amongst SDOs	▪ Consider developing some form of **SDG information sharing** and learning alliance with like-minded leading SDOs from other jurisdictions, such as BSI and Standards Australia, and consider ways in which SDOs could work together to support achievement of the SDGs.	▪ In this regard, some form of SDO-SDG accord could be useful in identifying common needs, common approaches, and opportunities for synergies and efficiencies.
Engaging Governments	▪ Consider the value of creating an **accord with the federal and other governments** on how to best support the SDGs.	▪ This could be helpful in identifying common needs and common approaches and opportunities for synergies and efficiencies.
Strategic Commitment to the SDGs	▪ Consider **formally committing to the SDGs,** and along with that develop an SDG strategy, publish it, and report on it.	▪ By formally committing to supporting the SDGs, SDOs can show leadership as organizations that wish to contribute to the achievement of the environmental, social, and economic goals included in the SDGs.

CSA GROUP™ | csagroup.org

Table 3: Recommendations for the Federal and Other Governments[16]

Theme	Recommendations
Labelling of Laws and Policies	▪ Given the important role that standards play in support of governments' laws and policies, and given the collaborative, multistakeholder nature of standards development, and in light of the fact that like the standards of CSA Group, many laws and policies can be considered to be supportive of achievement of particular sustainable development goals, it is recommended that federal and other governments engage in an **SDG labelling exercise** of their laws and policies similar to that undertaken by CSA Group. ▪ In carrying out the above-mentioned SDG labelling exercise, it is recommended that federal and other governments draw on the robust, sequential double-Delphi **SDG mapping process** developed by CSA Group with university and college partners. This will increase the likelihood that a consistent and credible cross-sectoral SDG labelling approach will be adopted and will be available to organizations.
Engagement, Education, and Communications	▪ It is recommended that the federal and other governments support and co-host with CSA Group and other SDOs a **conference on the value-accredited standards** in support of the achievement of the SDGs. Collaborations with other interested stakeholders would also be invaluable.
Collaborating with SDOs	▪ Given the integral role that standards play in assisting organizations to meet the SDGs, it is recommended that the federal and other governments work with SDOs and other parties to **support SDG standards work** and with associated SDG standards initiatives and activities of the type identified in this report. ▪ Keeping the foregoing in mind, it is recommended that the federal and other governments explore the feasibility of developing an accord with standards bodies on **how Canadian governments and standards bodies can optimally work together** to assist in meeting the SDGs.

Table 4: Recommendations for Users of Accredited Standards

Theme	Recommendations
Collaboration with SDOs	▪ It is recommended that users of accredited standards work closely with SDOs to ensure that accredited standards optimally assist the users in contributing to achievement of the SDGs.

Table 5: Recommendations for Volunteers in Standards Development Processes

Theme	Recommendations
Education	▪ It is recommended that members of Technical Committees familiarize themselves with the SDGs and communicate with SDOs on what sort of orientation or other training would best assist them in familiarizing themselves with the SDGs.

16 It is understood and recognized that the federal government is the lead government actor within Canada for development of an SDG strategy, as well as for measurement of progress and reporting. Therefore, the focal point of these government recommendations is on the federal government, but given that other governments (provincial, territorial, and municipal) are also important users of standards and participants in standards development, parts of these recommendations may be relevant to governments other than the federal government.

5 Conclusion

The SDGs are a set of 17 aspirational environmental, social, and economic goals that are part of a broader UN sustainable development agenda to be achieved on a global-wide basis by 2030. Governments have the primary responsibility of monitoring the SDGs by measuring progress against indicators and reporting results. The contributions and support of private sector and civil society actors towards achievement of the goals is an important feature of the UN Sustainable Development Agenda for 2030. The SDGs do not stipulate how the goals are to be achieved; instead, the question of how best to achieve the goals is left up to governments, standards development organizations, and other stakeholders.

Work undertaken for this project suggests that many existing laws and accredited standards provide the granular, operational roadmaps towards substantive achievement of the SDGs; however, there was a lack of clear information indicating how individual standards are linked to the SDGs. The objectives of this project were intended to address this issue, to assess how directly standards can be used as a tool in taking action to achieve the SDGs, as well as providing standards users with reliable information regarding how standards support the achievement of the SDGs at the indicator and target levels.

The first part of this project was to develop a robust and replicable mapping methodology that can be used to map the use of standards to the SDGs. Then a validation exercise in which 50 CSA standards were mapped to SDGs and their targets was undertaken. The validation exercise was intended to test the robustness and replicability of the mapping methodology as well as to compare the results to the preliminary mapping exercise done by CSA subject matter experts. It was found that the effectiveness in linking standards to SDG targets of the developed SDG Reference Dictionary as well as the UN LinkedSDG tool varied depending on how standards are structured and written. In some cases, it was found that the SDG Reference Dictionary and phrase matching was less effective and did not find all the matches to that of the preliminary mapping exercise done by CSA Group. The users of the SDG Reference Dictionary did not possess the same expertise as the subject matter experts who completed the preliminary mapping, so in using the mapping methodology some intents and outcomes were not captured and subsequently not mapped to any SDGs, which led to fewer linkages in some cases. From the results of the validation exercise, a revised, two-stage Delphi process was proposed.

Case studies undertaken for this project indicate a lack of awareness by some stakeholders in applying certain standards of the linkages to the SDGs. It was also found that in some cases, the users of a particular

standard may not be overly concerned with the linkages of a standard to SDGs, especially in use cases where a standard is referenced in legislation. However, explicit linkages between standards and SDGs would still provide valuable information to all stakeholders and standards users. From this, there is a suggestion made that a "labelling exercise" be undertaken by both governments and SDOs to expressly link standards to the environmental and social goals and targets embedded in the SDGs where such linkages can be found, so that organizations applying those standards can do so with some confidence that their use of the laws and standards does contribute to achieving sustainable development goals.

Having said this, because the existing body of laws and standards may not have been developed specifically with the SDGs in mind, a challenge that lies ahead is in "SDG labelling" of the existing body of laws and standards, and on a forward basis, ensuring that all new laws and standards are appropriately identified. In effect, a review of SDG linkages in standards and laws has revealed that they do not on a consistent basis make clear what sort of overarching social, environmental, and economic goals the standards and laws are intended to address, and that such labelling would be of value. This type of labelling exercise should be part of a broader communications strategy intended to raise the profile of laws and accredited standards as important contributors to achievement of the goals and targets articulated in the SDGs. This broader communications strategy could include a national multistakeholder conference highlighting the connections between laws, standards, and the SDGs, an awards program showcasing how organizations are using accredited standards in support of the SDGs, the development of new standards and "plus products" providing guidance on how to integrate the SDGs into business operations, guidance on how to engage in effective partnerships in support of SDGs and other goals, and SDG training.

Canadian companies considered to be sustainability leaders are drawing on and incorporating how they can contribute to achievement of the SDGs in their operations. Some Canadian businesses have adopted quite sophisticated approaches towards integrating the SDGs into their overall corporate responsibility approaches, drawing on a range of standards in the process. The work of these SDG leaders could become an important resource base and the foundation for a community of practice network to share ideas and assist in integrating the SDGs into their operations. Building on this preliminary research, more in-depth work of this nature could assist in filling a current knowledge gap and revealing which sectors and which SDGs have so far emerged as particularly important in the Canadian context.

Research undertaken for this report identified the emphasis that the federal government is correctly putting on collaboration as a central means of assisting in meeting the SDGs. Given the inherently collaborative, multistakeholder, and consensus-based nature of standards development, and the long history of successful collaborations between the federal and other governments and CSA and other SDOs on a wide variety of subjects and issues, there is considerable potential for accredited standards to perform an integral role in achieving the SDGs, and for collaboration between governments and SDOs on how best to support SDG-related standards activities. Internal changes in the operation of SDOs to better integrate the SDGs into current and future standards work would be well advised. As well, SDG application by Canadian SDOs themselves, and public reporting of progress being made in meeting the SDGs would be a valuable initiative.

The SDGs have emerged as an important and innovative normative instrument that is galvanizing governments, businesses, and civil society in the effort to achieve the goals. This project ultimately found that standards can provide foundational support to organizations that can assist them in meeting the SDGs. Therefore, efforts to identify and build linkages to the SDGs in existing and future standards (and other instruments) should be viewed as a priority leading up to 2030.

References

[1]   World Commission on Environment and Development, *Our Common Future*. Oxford, UK, Oxford University Press, 1987.

[2]   United Nations, "Transforming Our World, the 2030 Agenda for Sustainable Development," General Assembly, Oct. 21, 2015. [Online]. Available: https://undocs.org/A/RES/70/1

[3]   Employment and Social Development Canada, "Towards Canada's 2030 Agenda National Strategy: Interim Document," Government of Canada. [Online]. Available: https://www.canada.ca/content/dam/esdc-edsc/documents/programs/agenda-2030/7781_EmploymentSocialDevelopment_2030-ENv5.pdf

[4]   A. Vives, "Needed: A Systematic Effort to Monitor and Report Greenwashing Related to the SDGs," GreenBiz, Nov. 18, 2019. [Online]. Available: https://www.greenbiz.com/article/needed-systematic-effort-monitor-and-report-greenwashing-related-sdgs

[5]   Standards Council of Canada, "What Are Standards?" [Online]. Available: https://www.scc.ca/en/standards/what-are-standards (accessed May 2, 2021).

[6]   PricewaterhouseCoopers, "SDG Selector." [Online]. Available: https://datatech.pwc.com/SDGSelector/ (accessed May 2, 2021).

[7]   Responsible Mining Foundation and Columbia Center on Sustainable Investment, "Mining and the SDGs: A 2020 Status Update." [Online]. Available: https://www.responsibleminingfoundation.org/app/uploads/RMF_CCSI_Mining_and_SDGs_EN_Sept2020.pdf (accessed May 2, 2021).

[8]   Leadership Council, "Indicators and a Monitoring Framework for the Sustainable Development Goals," Revised Working Draft (Version 7) of the Sustainable Development Solutions Network – a Global Initiative for the United Nations, Mar. 20, 2015. [Online]. Available: https://irp-cdn.multiscreensite.com/be6d1d56/files/uploaded/150320%20SDSN%20Indicator%20Report.pdf

[9]   United Nations, "E-Handbook on the Sustainable Goals Indicators." United Nations Statistics Division. [Online]. Available: https://unstats.un.org/wiki/display/SDGeHandbook/Home (accessed May 2, 2021).

[10]   United Nations, "Department of Economic and Social Affairs Capacity Development." [Online]. Available: https://www.un.org/development/desa/cdpmo/#:~:text=It%20addresses%20the%20growing%20need,by%20the%20national%20statistical%20systems

[11]   K. Webb, "Sustainable Governance in the Twenty-First Century: Moving beyond Instrument Choice," in *Designing Government: From Instruments to Governance,* P. Eliadis, M. Hill, and M. Howlett, Eds., Montreal, QC, Canada: McGill-Queen's University Press, 2005, pp. 242–280. [Online]. Available: https://static1.squarespace.com/static/5a7b5fde0100279543e64b1b/t/5b3b1605f950b77a2618e05f/1530660232711/Webb-SusGov-2005-distribution.pdf

[12]   United Nations Department of Economic and Social Affairs, "Sustainable Development: The 17 Goals." [Online]. Available: https://sdgs.un.org/goals (accessed May 2, 2021).

[13]   R. Threlfall, A. King, J. Shulman, and W. Bartels, "The Time Has Come: The KPMG Survey of Sustainability Reporting 2020," KPMG IMPACT, KPMG, Dec. 2020. [Online]. Available: https://assets.kpmg/content/dam/kpmg/xx/pdf/2020/11/the-time-has-come.pdf

[14]   Government of Canada "Moving Forward Together: Canada's 2030 Agenda National Strategy." [Online]. Available: https://www.canada.ca/en/employment-social-development/programs/agenda-2030/moving-forward.html

[15]   K. Bissinger et al. "Linking Voluntary Standards to Sustainable Development Goals," International Trade Centre, Geneva, Switzerland, Oct. 2020. [Online]. Available: https://www.intracen.org/uploadedFiles/intracenorg/Content/Publications/Linking%20Voluntary%20Standards%20to%20Sustainable%20Development%20Goals_Final.pdf

[16]   Standards Council of Canada, "Frequently Asked Questions (FAQs) – Standards and Standardization." [Online]. Available: https://www.scc.ca/en/help/faqs (accessed May 2, 2021).

[17]   Global Compact Network Canada, "The 2020 Canadian SDG Accelerators Award." [Online]. Available: https://globalcompact.ca/sdg-accelerators-awards/ (accessed May 2, 2021).

[18]   CK Staff, "2021 Global 100 Ranking," Corporate Knights, Jan. 25, 2021. [Online]. Available: https://www.corporateknights.com/reports/2021-global-100/2021-global-100-ranking-16115328/

[19]   British Columbia Investment Management Corporation, "CEOs of Eight Leading Canadian Pension Plan Investment Managers Call on Companies and Investors to Help Drive Sustainable and Inclusive Economic Growth," Cision, Nov. 25, 2020. [Online]. Available: https://www.newswire.ca/news-releases/ceos-of-eight-leading-canadian-pension-plan-investment-managers-call-on-companies-and-investors-to-help-drive-sustainable-and-inclusive-economic-growth-844608554.html

[20]   SDG Accelerator for SMEs, Denmark, "SDG Accelerator." [Online]. Available: https://www.sdg-accelerator.org/content/sdg-accelerator/en/home/about/ (accessed May 2, 2021).

[21]   K. Webb, "ISO 26000: Bridging the Public/Private Divide in Transnational Business Governance Interactions," *Osgoode CLPE Research Paper #21,* 2012, https://doi.org/10.2139/ssrn.2144420.

[22]   K. Webb, "ISO 26000 Social Responsibility Standard as 'Proto Law' and a New Form of Global Custom: Positioning ISO 26000 in the Emerging Transnational Regulatory Governance Rule Instrument Architecture," *Transnatl. Leg. Theory,* vol. 6, no. 2, pp. 466–500, 2015, https://doi.org/10.1080/20414005.2015.1108002.

Appendix A – Glossary of Terms and Abbreviations

CATMA: A textual analysis tool that is available as an open access collaborative platform. "The tool was originally conceived in 2008 as a reimplementation of the DOS-based TACT (Textual Analysis Computing Tools), which allowed for digital text analysis. TACT was created at Toronto University under Ian Lancashire and programmed by John Bradley (cf. Lancashire et al. 1996)." (https://catma.de/philosophy/history/)

Delphi method: A qualitative way of assessment through a panel of subject matter experts who provide their opinion on a particular topic or subject in which they have expertise. Essentially, the panel of experts are consulted (like the Oracle of Delphi) in the belief that the opinion of a panel of experts is more valuable than the opinion of individuals. In a double or two-stage Delphi process, results from one evaluation are evaluated by a second set of subject matter experts.

EBSCO: A group of searchable library databases that provide access to licensed content from journals, e-publications, and e-books (https://www.ebsco.com/).

GCNC/UNGCN: Global Compact Network Canada (GCNC) and United Nations Global Compact Network (UNGCN) are networks of industry firms and organizations committed to the Sustainable Development Goals and to corporate sustainability in the areas of human rights, labour, environment, and anti-corruption as expressed in the Ten Principles of the UN Global Compact (https://www.unglobalcompact.org/what-is-gc/mission/principles).

NVIVO: A software platform developed by QSR International that is used for qualitative data analysis, coding, finding patterns, and insights from textual, graphical, and other media sources (https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home).

OMNI: An online academic search tool allowing access to online and physical library resources from 16 Ontario universities forming the Ontario Council of University Libraries (OCUL)

SDG/UN SDG: Sustainable Development Goal(s) or United Nations Sustainable Development Goal(s) form the UN 2030 Agenda for Sustainable Development, formally adopted in 2015 by all the member nations of the United Nations with a target date of 2030 to achieve the goals.

SDOs: Standards development organizations (SDOs) are organizations that are responsible for the development of standards in specific industries. They may be internationally based organizations and better known by their acronyms such as ISO or nationally based organizations such as CSA Group (in Canada) or ASME (in the U.S.); often their standards may be adopted by local regulatory bodies or implemented into policies or laws. A list of some of the SDOs that are used in North America can be obtained through the American National Standards Institute (https://www.standardsportal.org/usa_en/resources/sdo.aspx) or in Canada through the Standards Council of Canada (https://www.scc.ca/en/accreditation/standards/directory-of-accredited-standards-development-organizations).

TCPS2: Tri-Council Policy Statement 2 (TCPS2) is the 2018 guideline for ethical conduct for research involving humans and is administered by the Government of Canada Panel on Research Ethics. This policy ensures ethical research guidelines and protocol for conducting research that involves human participants and is adopted by most post-graduate institutions in Canada and organizations conducting research involving those participants.

Web of Science: A website platform that provides a searchable database of scholarly articles in the science, social science, arts, and humanities. The platform is available on a subscription basis from its producer Clarivate (https://clarivate.com/webofsciencegroup) and is made available through some institutional library access portals.

Wordstat: A content analysis and text mining software produced and supported by Provalis Research (https://provalisresearch.com/products/content-analysis-software/wordstat-whats-new/).

Appendix B – SDG Reference Dictionary

Explanation Notes

The example table in this appendix is based on the full Excel version of the Inter-Agency and Expert Group on Sustainable Development Goal Indicators (IAEG-SDGs) Tier Classification for Global SDG Indicators (From https:// unstats.un.org/sdgs/iaeg-sdgs/tier-classification/. ©2020 United Nations. Reprinted with the permission of the United Nations). Within the table, the first three columns are taken directly from the UN Excel document, using the UN's tier classifications. The remaining columns are open codes generated from the metadata for the indicators taken from the UN SDG E-Handbook [9].

Note that five open codes were generated by three independent researchers using portion of phrases that indicate processes or outcomes; a fourth researcher independently correlated the codes; a fifth researcher (a subject matter expert on the UN SDGs) took the top five codes and listed them in the SDG Reference Dictionary; where there were no correlations or a duplication of the target or goal phrasing, then the fifth researcher did not include any open codes.

The further granular details within the reference dictionary were necessary to fully understand the 169 targets, and 232 indicators that are intended to be achieved within each SDG, so that effective links between standards and the SDG goals could be made.

Table 6. SDG Reference Dictionary based on Tier Classification Sheet (as of 17 July 2020).

(Columns A, B, and C from https://unstats.un.org/sdgs/iaeg-sdgs/tier-classification/. ©2020 United Nations. Reprinted with the permission of the United Nations.)

UNSD Indicator Code*	Target	Indicator	Open Code 1	Open Code 2	Open Code 3	Open Code 4	Open Code 5
Goal 1. End poverty in all its forms everywhere							
C010101	1.1 By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day	1.1.1 Proportion of the population living below the international poverty line by sex, age, employment status and geographic location (urban/rural)	The proportion of the employed population below the international poverty line of US$1.90 per day, also referred to as the working poverty rate, is defined as the share of employed persons living in households with per-capita consumption or income that is below the international poverty line of US$1.90.				
C010201	1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions	1.2.1 Proportion of population living below the national poverty line, by sex and age	National poverty estimates are derived from household survey data	This information is collected either through recall questions using lists of consumption items or through diaries in which respondents record all expenditures daily			
C010202		1.2.2 Proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions	Official multidimensional poverty headcount, by sex, and age (% of population) Average number of deprivations (intensity) Official multidimensional poverty headcount (% of total households) Multidimensional deprivation for children (% of population under 18)				
C010301	1.3 Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable	1.3.1 Proportion of population covered by social protection floors/systems, by sex, distinguishing children, unemployed persons, older persons, persons with disabilities, pregnant women, newborns, work-injury victims and the poor and the vulnerable	Effective coverage of social protection is measured by the number of people who are either actively contributing to a social insurance scheme or receiving benefits (contributory or non-contributory).	The indicator reflects the proportion of persons effectively covered by a social protection system, including social protection floors. It also reflects the main components of social protection: child and maternity benefits, support for persons without a job, persons with disabilities, victims of work injuries and older persons.	ASPIRE coverage indicators refer to the 'effective' coverage definition, measuring the direct and indirect beneficiaries who are actually receiving social protection benefits at the time nationally representative household survey data are collected, as within a target group (total population, for different income quintiles, total population in urban and rural areas)		

[a] Acknowledging that the United Nations Framework Convention on Climate Change is the primary international, intergovernmental forum for negotiating the global response to climate change.

[b] Taking into account ongoing World Trade Organization negotiations, the Doha Development Agenda and the Hong Kong ministerial mandate.

Appendix C – Initial Mapping Methodology

Figure 7: Initial Mapping Methodology


```
                    1. Select and obtain a
                      copy of the standard
                              ↓
                    2. Conduct preliminary
                           mapping
                              ↓
 SDG Reference                                    LinkedSDG
 Dictionary Tool  ◇ 3. Select Phrase/            Tool
                    Concept Mapping Tool  →
        ↓                                              ↓
 4. Identify key phrases                      7. Use LinkedSDG
    or wording                                Tool to identify SDG
        ↓                                     linkages
 SDG          5. Compare key phrases
 Reference  → to the SDG Reference
 Dictionary   Dictionary
        ↓
 6. Match phrases to
    the SDG (subjective
    evaluation)
                    ◇ 8. Compare mapping results ◇
                              ↓
                    9. Finalize mapping
                         outcomes
        ↓                    ↓                    ↓
 Final mapping      Review level of        Review of SDG
   results          correlation between    expressions
                    mapping approaches
```

The steps for applying this mapping procedure as described in Figure 7 are outlined below:

1. Select and obtain a copy of the standard in an extractable format.

   ▪ Verify that there is an Introduction, a Scope, or a similar section that describes the process and/or outcome of the standard.

2. Conduct a preliminary mapping of the standard to the SDGs using the full body of the standard. Identify connections between the standard and the SDGs at the target level, based on a firm understanding of the standard's primary objectives and intended use, and the UN SDGs and their respective targets. Note: At CSA Group this step was completed in advance, by standards development staff.

3. Select one of the following phrase or concept matching tools:

   ▪ SDG Reference Dictionary tool – proceed to Steps 4, 5, and 6.

   ▪ LinkedSDG tool – proceed to Step 7.

4. Identify key phrases or wording that relate to a process and/or outcome that is the focus of the standard (for the sake of simplicity aim for no more than five key phrases).

   ▪ Copy the Scope and Introduction sections of the standard to a .txt or .doc file. If preferred, one may also physically print the Scope and Introduction sections of the standard.

   ▪ Identify key phrases using one of the following approaches:

      i. Use a physical highlighting device and a printed copy of the standard.

      ii. Highlight phrases directly within a .txt or .doc file or in an appropriate .pdf file format.

      iii. Use a text extraction software such as MonkeyLearn (https://monkeylearn.com/) to extract expressions (keeping in mind that this is a natural language query and may miss some of the intent of the standard).

5. Compare the key phrases and expressions obtained in Step 3 with the SDG Reference Dictionary using the ctrl-F function in Excel (or create a Macro tool that allows this function to be done repeatedly) – note that if a key phrase is too complex, then it will not be matched well, and if the key phrase is too short (one word) and non-technical, it may match multiple SDGs, targets, and indicators. If exact matching does not occur (most often expected), then a human element (manual evaluation) is required at this step to interpret phrases or expressions that are synonymous to those described by the SDG Reference Dictionary.

6. Identify the locations in the SDG Reference Dictionary where the expression from the standard is found and do a comparison of meanings and intentions. This is where the human element is important. A list of SDGs will result based on the matching with the appropriate cells. Note that a certain amount of human judgement needs to be used to identify the technical context of a phrase with the technical context of an equivalent phrase in the SDG Reference Dictionary. It is recognized that exact matching of words or phrases will not occur in most cases and so the matching of meanings needs to be included in the results. The fundamental point is that the matching of meanings and intentions need to be included at the indicator level; that is, the standard process/ outcome phrase must match one of the indicators or indicators open codes to imply that the standard has a direct relationship with the SDG. If the standard phrase or expression only matches the target level described in the SDG Reference Dictionary, then the relationship between the standard and the SDG may be indirect; in other words, using the standard will address the spirit of the SDG target but will not contribute to a measurable outcome that would indicate a measurable impact on the SDG target. Proceed to Step 8.

NOTE: It is sufficient to have a single match with a target, indicator, or indicator phrase to be able to link the standard to an SDG. This is a binary (yes/no) decision. It is however possible to grade the degree of connection to an SDG based on the number of matches.

7. Use the LinkedSDG tool to identify key concepts and linkages between the standard and the SDGs.

   ▪ Insert/upload a .txt or .doc file containing the Introduction and Scope sections of the standard into the LinkedSDG tool (http://linkedsdg.apps.officialstatistics.org/#/) to identify relevant expressions and links to the SDGs.

   ▪ Capture the list of the SDG connections identified by the LinkedSDG tool.

   ▪ Proceed to Step 8.

8. Conduct a comparison of mapping results obtained from either:

   ▪ Step 2 (Preliminary Mapping) and Step 6 (SDG Reference Dictionary), or

   ▪ Step 2 (Preliminary Mapping) and Step 7 (LinkedSDG tool).

9. Finalize mapping outcomes:

   ▪ Confirm the final mapping results of the standards to the SDGs based on the comparison in Step 7 and human judgement. This result is valuable to standards users who can be informed that the implementation of specific standards within their organization will help them support specific SDGs.

   ▪ Based on the comparison conducted in Step 8, assess the level of correlation and agreement between the results obtained from Step 2 and either Steps 6 or 7:

      i. When the results are highly correlated, then there is agreement between standards staff assessments and the assessments conducted using either the SDG Reference Dictionary or the Linked SDG tool, this indicates a level of transparency in how the standards and SDGs are linked.

      ii. When there are differences – minor or major gaps, between the preliminary assessment conducted by standards staff, and the results generated using the SDG Reference Dictionary and the LinkedSDG tool – this indicates either that the standards language relating to certain SDGs may have been found deep within the body of the standard or that the preliminary mapping results should be reassessed. In the case of the former, this would imply that the Introduction and Scope sections may need to be adjusted to reflect additional expected outcomes.

   ▪ Review the SDG Reference Dictionary expressions of relevance to the standard, and consider adjustments to the standards language in future publications to better address the indicator-level objectives of the SDGs.

Appendix D – Reference List of Articles

Mapping Standards to the SDGs: Literature Review

Theme – Oriented around Standards

EvalSDGS. (n.d.). Welcome to EvalSDGS! Retrieved Sept. 27, 2021, from https://evalsdgs.org

Global Compact Network Canada. (2020). The Canadian SDG Accelerators Awards. https://globalcompact.ca/sdg-accelerators-awards/sdg-accelerators-awards/

Goh, C. S., Jack, L., & Bajracharya, A. (2020). Qualitative study of sustainability policies and guidelines in the built environment. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction, 12*(2), 04520016. https://doi.org/10.1061/(asce)la.1943-4170.0000395

ISO. (2018, September–October). *ISO focus: Our vision for a better world.* https://www.iso.org/isofocus_130.html

Moschen, S. A., Macke, J., Bebber, S., & Benetti Correa da Silva, M. (2019). Sustainable development of communities: ISO 37120 and UN goals. *International Journal of Sustainability in Higher Education,* 20(5), 887–900. https://doi.org/10.1108/IJSHE-01-2019-0020

Ordonez-Ponce, E., & Khare, A. (2021). GRI 300 as a measurement tool for the United Nations Sustainable Development Goals: Assessing the impact of car makers on sustainability. *Journal of Environmental Planning and Management, 64*(1), 47–75. https://doi.org/10.1080/09640568.2020.1746906

Robinson, O. J., Tewkesbury, A., Kemp, S., & Williams, I. D. (2018). Towards a universal carbon footprint standard: A case study of carbon management at universities. *Journal of Cleaner Production, 172,* 4435–4455. https://doi.org/10.1016/j.jclepro.2017.02.147

Treacy, R., Humphreys, P., McIvor, R., & Lo, C. (2019). ISO14001 certification and operating performance: A practice-based view. *International Journal of Production Economics, 208*(March 2018), 319–328. https://doi.org/10.1016/j.ijpe.2018.12.012

Theme – Describing the Framework of Sustainable Development Goals

Buonocore, J. J., Choma, E., Villavicencio, A. H., Spengler, J. D., Koehler, D. A., Evans, J. S., … Sanchez-Pina, R. (2019). Metrics for the sustainable development goals: Renewable energy and transportation. *Palgrave Communications*, 5(1), 1–14. https://doi.org/10.1057/s41599-019-0336-4

Dang, H. A. H., & Serajuddin, U. (2020). Tracking the sustainable development goals: Emerging measurement challenges and further reflections. *World Development, 127,* 104570. https://doi.org/10.1016/j.worlddev.2019.05.024

Fuso-Nerini, F., Tomei, J., To, L. S., Bisaga, I., Parikh, P., Black, M., … Mulugetta, Y. (2018). Mapping synergies and trade-offs between energy and the Sustainable Development Goals. *Nature Energy, 3*(1), 10–15. https://doi.org/10.1038/s41560-017-0036-5

Hák, T., Janoušková, S., & Moldan, B. (2016). Sustainable Development Goals: A need for relevant indicators. *Ecological Indicators, 60,* 565–573. https://doi.org/10.1016/j.ecolind.2015.08.003

International Council for Science (ICSU). (2017). *A Guide to SDG interactions: From science to implementation.* https://council.science/wp-content/uploads/2017/05/SDGs-Guide-to-Interactions.pdf

Nilsson, M. (2016, December 16). *Understanding and mapping important interactions among SDGs: Readying institutions and policies for integrated approaches to implementation of the 2030 Agenda.* [Background paper]. High-Level Political Forum on Sustainable Development, 2017, Vienna, Austria. https://sustainabledevelopment. un.org/content/documents/12067Understanding%20and%20mapping%20important%20interactions%20 among%20SDGs.pdf

Nilsson, M., Griggs, D., & Visbeck, M. (2016). Policy: Map the interactions between Sustainable Development Goals. *Nature, 534*(7607), 320–322. https://doi.org/10.1038/534320a

Ringler, C., Willenbockel, D., Perez, N., Rosegrant, M., Zhu, T., & Matthews, N. (2016). Global linkages among energy, food and water: An economic assessment. *Journal of Environmental Studies and Sciences, 6*(1), 161–171. https://doi. org/10.1007/s13412-016-0386-5

Rosenstock, T. S., Lamanna, C., Chesterman, S., Hammond, J., Kadiyala, S., Luedeling, E., … van Wijk, M. T. (2017). When less is more: Innovations for tracking progress toward global targets. *Current Opinion in Environmental Sustainability, 26–27*(January), 54–61. https://doi.org/10.1016/j.cosust.2017.02.010

Stafford-Smith, M., Griggs, D., Gaffney, O., Ullah, F., Reyers, B., Kanie, N., … O'Connell, D. (2017). Integration: The key to implementing the Sustainable Development Goals. *Sustainability Science, 12*(6), 911–919. https://doi.org/10.1007/ s11625-016-0383-3

UN Statistics Division. (2020). *Global indicator framework for the Sustainable Development Goals and targets of the 2030 Agenda for Sustainable Development. Work of the Statistical Commission pertaining to the 2030 Agenda for Sustainable Development.* https://unstats.un.org/sdgs/indicators/Global%20Indicator%20Framework%20after%20 2021%20refinement_Eng.pdf, Indicator Framework after 2019 refinement https://unstats.un.org/sdgs/indicators/ Global Indicator Framework_A.RES.71.313 Annex.pdf

Waage, J., Yap, C., Bell, S., Levy, C., Mace, G., Pegram, T., … Poole, N. (2015). Governing the UN Sustainable Development Goals: Interactions, infrastructures, and institutions. *The Lancet Global Health, 3*(5), e251–e252. https://doi.org/10.1016/S2214-109X(15)70112-9

Theme – Oriented around Reporting Linkages

Avtar, R., Aggarwal, R., Kharrazi, A., Kumar, P., & Kurniawan, T. A. (2020). Utilizing geospatial information to implement SDGs and monitor their progress. *Environmental Monitoring and Assessment, 192*(1). https://doi. org/10.1007/s10661-019-7996-9

Bakardjieva, R. (2016). Sustainable development and corporate social responsibility: Linking goals to standards. *Journal of Innovations and Sustainability, 2*(4), 23–25. https://www.researchgate.net/publication/313377529_ Sustainable_Development_and_Corporate_Social_Responsibility_Linking_Goals_to_Standards

Consolandi, C., Phadke, H., Hawley, J., & Eccles, R. G. (2020). Material ESG outcomes and SDG externalities: Evaluating the health care sector's contribution to the SDGs. *Organization and Environment, 33*(4), 511–533. https:// doi.org/10.1177/1086026619899795

Dalampira, E. S., & Nastis, S. A. (2020). Mapping Sustainable Development Goals: A network analysis framework. *Sustainable Development, 28*(1), 46–55. https://doi.org/10.1002/sd.1964

Dang, H. A. H., & Serajuddin, U. (2020). Tracking the Sustainable Development Goals: Emerging measurement challenges and further reflections. *World Development, 127,* 104570. https://doi.org/10.1016/j.worlddev.2019.05.024

Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., … Zlatanova, D. (2015). The IPBES conceptual framework – connecting nature and people. *Current Opinion in Environmental Sustainability, 14,* 1–16. https://doi.org/10.1016/j.cosust.2014.11.002

Fonseca, L., & Carvalho, F. (2019). The reporting of SDGs by quality, environmental, and occupational health and safety-certified organizations. *Sustainability (Switzerland), 11*(20). https://doi.org/10.3390/su11205797

Global Reporting Imitative & United Nations Global Compact. (2017). *Business reporting on the SDGs: An analysis of the goals and targets.* https://www.unglobalcompact.org/library/5361

Jan Kraak, M., Ricker, B., & Engelhardt, Y. (2018). Challenges of mapping sustainable development goals indicators data. *ISPRS International Journal of Geo-Information, 7*(12). https://doi.org/10.3390/ijgi7120482

KPMG. (2018). *How to report on the SDGs: What good looks like and why it matters.* https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2018/02/how-to-report-on-sdgs.pdf

Kussul, N., Lavreniuk, M., Kolotii, A., Skakun, S., Rakoid, O., & Shumilo, L. (2020). A workflow for Sustainable Development Goals indicators assessment based on high-resolution satellite data. *International Journal of Digital Earth, 13*(2), 309–321. https://doi.org/10.1080/17538947.2019.1610807

Lehmann, A., Masò, J., Nativi, S., & Giuliani, G. (2020). Towards integrated essential variables for sustainability. *International Journal of Digital Earth, 13*(2), 158–165. https://doi.org/10.1080/17538947.2019.1636490

Martin, J. A. R., de Dios Jiménez Aguilera, J., Martín, J. M. M., & Fernández, J. A. S. (2018). Crisis in the Horn of Africa: Measurement of progress towards Millennium Development Goals. *Social Indicators Research, 135*(2), 499–514. https://doi.org/10.1007/s11205-016-1491-2

McArthur, J. W., & Rasmussen, K. (2017). *Who and what gets left behind? Assessing Canada's domestic status on the Sustainable Development Goals.* Global Economy and Development at Brookings. https://www.brookings.edu/wp-content/uploads/2017/10/working-paper_assessing-canadas-domestic-status-on-the-sdgs1.pdf

Miola, A., & Schiltz, F. (2019). Measuring sustainable development goals performance: How to monitor policy action in the 2030 Agenda implementation? *Ecological Economics, 164*(January), 106373. https://doi.org/10.1016/j.ecolecon.2019.106373

Patterson, M., McDonald, G., & Hardy, D. (2017). Is there more in common than we think? Convergence of ecological footprinting, emergy analysis, life cycle assessment and other methods of environmental accounting. *Ecological Modelling, 362,* 19–36. https://doi.org/10.1016/j.ecolmodel.2017.07.022

Permanyer, I. (2013). The measurement of success in achieving the Millennium Development Goals. *Journal of Economic Inequality, 11*(3), 393–415. https://doi.org/10.1007/s10888-012-9228-1

Pomati, M., & Nandy, S. (2020). Measuring multidimensional poverty according to national definitions: Operationalising target 1.2 of the Sustainable Development Goals. *Social Indicators Research, 148*(1), 105–126. https://doi.org/10.1007/s11205-019-02198-6

Sessa, M. (2016). Measuring and monitoring the achievements of the Millennium Development Goals through dynamic composite indices. *Social Indicators Research, 127*(2), 469–503. https://doi.org/10.1007/s11205-015-0985-7

Shinwell, M., & Cohen, G. (2020). Measuring countries' progress on the Sustainable Development Goals: Methodology and challenges. *Evolutionary and Institutional Economics Review, 17*(1), 167–182. https://doi.org/10.1007/s40844-019-00132-6

Smiciklas, J., Prokop, G., Stano, P., & Sang, Z. (2017). *United 4 smart sustainable cities: Collection methodology for key performance indicators for smart sustainable cities.* https://unece.org/DAM/hlm/documents/Publications/U4SSC-CollectionMethodologyforKPIfoSSC-2017.pdf

Verboven, H., & Vanherck, L. (2016). Sustainability management of SMEs and the UN Sustainable Development Goals. *Uwf UmweltWirtschaftsForum, 24*(2–3), 165–178. https://doi.org/10.1007/s00550-016-0407-6

World Bank. (2020). *IEA, IRENA, UNSD, World Bank, WHO, 2020. Tracking SDG 7: The Energy Progress Report 2020.* https://www.irena.org/publications/2020/May/Tracking-SDG7-The-Energy-Progress-Report-2020

Theme – Around Exploring Relationships between Standards and SDGs or Millennium Goals

Agarwal, N., Gneiting, U., & Mhlanga, R. (2017). *RAISING THE BAR: Rethinking the role of business in the Sustainable Development Goals.* Oxfam Discussion Papers. https://www-cdn.oxfam.org/s3fs-public/dp-raising-the-bar-business-sdgs-130217-en_0.pdf

Amey, M., & Whooley, N. (2018). *Corporate reporting on the SDGs: Mapping a sustainable future.* https://www.pimco.ca/en-ca/insights/viewpoints/2018/12/corporate-reporting-on-the-un-sdgs-mapping-a-sustainable-future/

Brandenburg, M., Govindan, K., Sarkis, J., & Seuring, S. (2014). Quantitative models for sustainable supply chain management: Developments and directions. *European Journal of Operational Research, 233*(2), 299–312. https://doi.org/10.1016/j.ejor.2013.09.032

Cole, M. J., Bailey, R. M., & New, M. G. (2014). Tracking sustainable development with a national barometer for South Africa using a downscaled "safe and just space" framework. *Proceedings of the National Academy of Sciences of the United States of America, 111*(42), E4399–E4408. https://doi.org/10.1073/pnas.1400985111

Edomah, N., Foulds, C., & Jones, A. (2017). Policy making and energy infrastructure change: A Nigerian case study of energy governance in the electricity sector. *Energy Policy, 102*(July 2016), 476–485. https://doi.org/10.1016/j.enpol.2016.12.053

Huovila, A., Bosch, P., & Airaksinen, M. (2019). Comparative analysis of standardized indicators for smart sustainable cities: What indicators and standards to use and when? *Cities, 89*(January), 141–153. https://doi.org/10.1016/j.cities.2019.01.029

Moldavska, A., & Welo, T. (2019). A holistic approach to corporate sustainability assessment: Incorporating sustainable development goals into sustainable manufacturing performance evaluation. *Journal of Manufacturing Systems, 50*(November 2017), 53–68. https://doi.org/10.1016/j.jmsy.2018.11.004

Odwazny, F., Wojtkowiak, D., Cyplik, P., & Adamczak, M. (2019). Concept for measuring organizational maturity supporting sustainable development goals. *Scientific Journal of Logistics, 15*(2), 237–247. http://doi.org/10.17270/J.LOG.2019.321

Ohno, I., Konya, K., Shiga, H., Murillo, F., & Charvet, E. (2019). Scaling up business impact on the SDGs. 2030 Agenda for Sustainable Development. https://t20japan.org/wp-content/uploads/2019/03/t20-japan-tf1-8-scaling-up-business-impact-sdgs.pdf

Pandey, P. C. (2015). Business as a force for good: Action and leadership through and beyond post 2015 agenda. *Asian Biotechnology and Development Review, 17*(2), 69–84. https://www.researchgate.net/publication/319097417_Business_as_a_force_for_good_Action_and_leadership_through_and_beyond_post_2015_agenda

Rosati, F., & Faria, L. G. D. (2019). Business contribution to the Sustainable Development Agenda: Organizational factors related to early adoption of SDG reporting. *Corporate Social Responsibility and Environmental Management, 26*(3), 588–597. https://doi.org/10.1002/csr.1705

Rousseau, H. E., Berrone, P., & Gelabert, L. (2019). Localizing Sustainable Development Goals: Nonprofit density and city sustainability. *Academy of Management Discoveries, 5*(4), 487–513. https://doi.org/10.5465/amd.2018.0151

Saint Akadiri, S., Alola, A. A., Akadiri, A. C., & Alola, U. V. (2019). Renewable energy consumption in EU-28 countries: Policy toward pollution mitigation and economic sustainability. *Energy Policy, 132*(February), 803–810. https://doi.org/10.1016/j.enpol.2019.06.040

Scheyvens, R., Banks, G., & Hughes, E. (2016). The private sector and the SDGs: The need to move beyond "business as usual." *Sustainable Development, 24*(6), 371–382. https://doi.org/10.1002/sd.1623

Tjoa, A. M., & Tjoa, S. (2016). The role of ICT to achieve the UN Sustainable Development Goals (SDG). In *IFIP Advances in Information and Communication Technology, 481,* 3–13. https://doi.org/10.1007/978-3-319-44447-5_1

Ven, H. Van Der, Bernstein, S., & Hoffmann, M. (2019). Valuing the contributions of nonstate and subnational actors to climate governance. *Global Environmental Politics, 17*(1), 1–20. https://doi.org/10.1162/GLEP_a_00387

Zimon, D., Tyan, J., & Sroufe, R. (2019). Drivers of sustainable supply chain management: practices to alignment with UN Sustainable Development Goals. *International Journal for Quality Research, 14*(1), 219–236. https://doi.org/10.24874/IJQR14.01-14

Appendix E – Final Mapping Methodology

The final mapping methodology developed as part of this research project is shown in Figure 8, and the sequential steps for applying this final 2-phase standards-SDG mapping procedure are outlined below.

Figure 8: Standards – SDG Mapping Methodology (Legend: Phase 1 is identified using orange blocks, Phase 2 is identified using blue blocks, finalization of results is identified using green blocks)
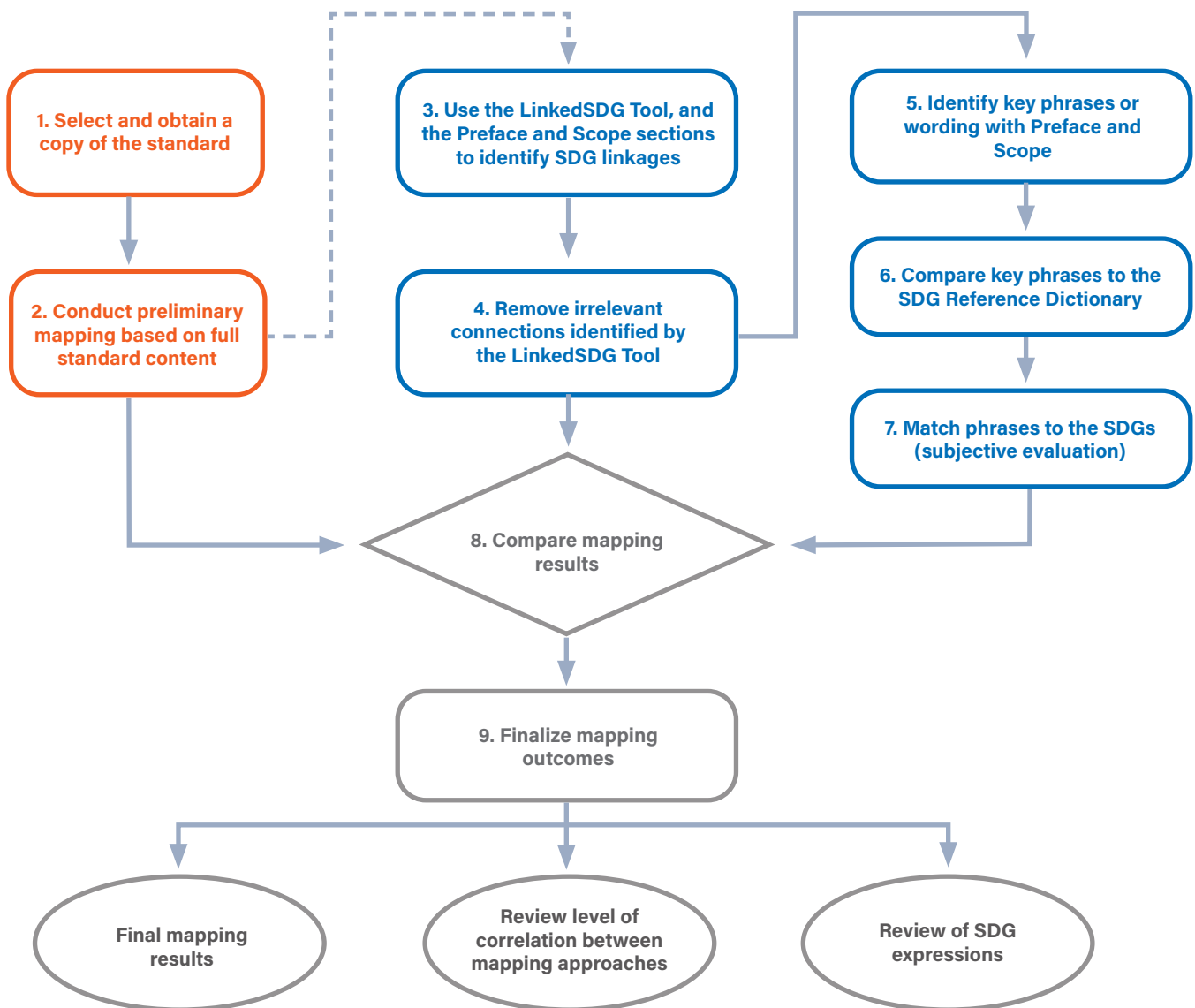
Phase 1: Preliminary Mapping

The preliminary mapping steps should be completed by the project manager together with a subgroup or the entire Technical Committee responsible for developing the standard.

1. Select and obtain a copy of the standard in an extractable format.
   - Verify that there is an Introduction and Scope, or similar section that describes the process and/or outcome of the standard.

2. Conduct a preliminary mapping of the standard to the SDGs using the full body of the standard. Identify connections between the standard and the SDGs at the target level, based on a firm understanding of the standard's primary objectives and intended use, and the UN SDGs and their respective targets. Note: At CSA Group this step was completed in advance by standards development staff.

Phase 2: Mapping Verification

The mapping verification steps should be completed by one or two members of the Central Body, responsible for overseeing SDG mapping efforts. The Central Body member(s) should first review the mapping results from Phase 1 before working through the following steps, utilizing the SDG Reference Dictionary and the UN LinkedSDGs tool.

3. Use the LinkedSDG tool to identify key concepts and linkages between the standard and the SDGs.
   - Insert/upload a .txt or .doc file containing the Introduction and Scope sections of the standard into the LinkedSDG tool (http://linkedsdg.apps.officialstatistics.org/#/) to identify relevant expressions and links to the SDGs.
   - Capture the list of the SDG connections identified by the LinkedSDG tool.

4. Analyze the list of SDG connections identified by the LinkedSDG tool, and determine whether the connections are relevant or irrelevant.
   - This step will rely on the use of human judgement to determine whether the match in terminology or key concepts identified using the LinkedSDG tool also reflects a match of context, meanings, and outcomes of using the standard.

5. Working with the Scope and Introduction sections only, identify short key phrases (one to three words) that relate to a process and/or outcome that is the focus of the standard (for the sake of simplicity aim for no more than five key phrases).
   - Copy the Scope and Introduction sections of the standard to a .txt or .doc file. If preferred, you may also print the Scope and Introduction sections of the standard.
   - Identify key phrases using one of the following approaches:
     i. Use a physical highlighting device and a printed copy of the standard.
     ii. Highlight phrases directly within a .txt or .doc file or in an appropriate .pdf file format.
     iii. Use a text extraction software such as MonkeyLearn (https://monkeylearn.com/) to extract expressions (keeping in mind that this is a natural language query and may miss some of the intent of the standard).

6. Compare the key phrases and expressions obtained in Step 5 with the SDG Reference Dictionary using the ctrl-F function in Excel (or create a Macro tool that allows this function to be done repeatedly).

   Note: If a key phrase is too complex, then it will not be matched well, and if the key phrase is too short (one word) and non-technical, it may match multiple SDGs, targets, and indicators. If exact matching does not occur (most often expected), then a human element (manual evaluation) is required at this step to interpret phrases or expressions that are synonymous to those described by the SDG Reference Dictionary.

7. Identify the locations in the SDG Reference Dictionary where the expression from the standard is found and do a comparison of meanings and intentions. This is where human judgement is important. A list of SDGs will result based on the matching with the appropriate cells. It is important to identify all relevant matches at the target, indicator, or open codes levels.

NOTE: A certain amount of human judgement needs to be used to identify the technical context of a phrase with the technical context of an equivalent phrase in the SDG Reference Dictionary. It is recognized that exact matching of words or phrases will not occur in most cases and so the matching of meanings needs to be included in the results.

NOTE: It is sufficient to have a single match with a target, indicator, or indicator phrase to be able to link the standard to an SDG. This is a binary (yes/no) decision.

Finalizing the Mapping Results

Once Phases 1 and 2 have been completed, the project manager and the member(s) of the Central Body should review any differences in the mapping results generated in Phase 1 and Phase 2. This review serves as an opportunity to confirm that the Phase 1 results have a strong rationale behind them, to make adjustments where the connections identified in Phase 1 are not sufficiently strong, and to identify any additional connections that may have been identified in Phase 2 that were overlooked in Phase 1. The mapping results should be reviewed by the Technical Committee prior to finalization.

8. Conduct a comparison of the mapping results obtained from Step 2 (Preliminary Mapping), Step 7 (SDG Reference Dictionary), and Step 4 (LinkedSDG tool). Identify the similarities, as well as the cause for any differences in the results.

9. Finalize mapping outcomes:

- Using human judgement, the project manager and the Central Body member(s) should confirm the final mapping results of the standards to the SDGs based on the comparison in Step 8. The project manager should present the final mapping results to the Technical Committee for final evaluation and approval. The final mapping results should be captured in the designated SDG mapping database.

- Based on the comparison conducted in Step 8, assess the level of correlation and agreement between the results obtained from Step 2, Step 4, and Step 7:

  i. When the results are highly correlated, this indicates a level of transparency in how the standards and SDGs are linked.

  ii. When there are differences – minor or major gaps between the preliminary assessment conducted by the project manager, and the results generated using the SDG Reference Dictionary and the LinkedSDG tool – this indicates either that the standards language relating to certain SDGs may have been found deep within the body of the standard or that the preliminary mapping results should be reassessed. In the case of the former, this would imply that the Introduction and Scope sections may need to be adjusted to reflect additional expected outcomes.

- Review the SDG Reference Dictionary expressions of relevance to the standard, and consider adjustments to the standards language in future publications to better address the indicator-level objectives of the SDGs.

Appendix F – Corporate Knights Global 100

Table 7: Selected Global 100 2021 Canadian Companies – References to UN SDGs

Firm	General	SDG1	SDG2	SDG3	SDG4	SDG5	SDG6	SDG7	SDG8	SDG9	SDG10	SDG11	SDG12	SDG13	SDG14	SDG15	SDG16	SDG16
Stantec		✓	✓	✓	✓	✓	✓	✓		✓		✓		✓		✓		
Transcontinental						✓		✓	✓	✓	✓		✓			✓		
Bank of Montreal		✓		✓		✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
Sun Life				✓		✓		✓	✓					✓				
IGM Financial		✓				✓								✓			✓	✓
Teck Resources				✓		✓	✓		✓				✓	✓		✓		✓
Agnico Eagle Mines	✓																	
Cascades																		
Telus				✓	✓							✓		✓				✓
Cogeco																		
Canadian Tire																		
Canadian National Railway						✓			✓	✓		✓		✓				
Canadian Solar	✓																	

CSA GROUP™   csagroup.org

Table 8: Selected Global 100 2021 Canadian Companies – References to ISO and CSA Standards/Committees/Standards in Progress

Firm	ISO 9001 Quality	ISO 14001/TC 207 Environmental	ISO 14064 Greenhouse	ISO 22001 Food Safety	ISO 27001 IT Security	ISO 45001 OHSA	ISO TC 322 Sustainable Finance & CSA MC Sustainable Finance	CSA Z1003 OHSAS	CSA Health Care/Cleaning Standard (in development)
Stantec	✓	✓			✓	✓			
Transcontinental				✓					
Bank of Montreal		✓	✓		✓		✓		
Sun Life									
IGM Financial									
Teck Resources									✓
Agnico Eagle Mines		✓							
Cascades									
Telus		✓						✓	
Cogeco									
Canadian Tire									
Canadian National Railway			✓						
Canadian Solar									

Appendix G – Global Compact Network Canada SDG Accelerator

Table 9: References to UN SDGs by Selected Listed Canadian Organizations – Large Firms

Firm	SDG	Target
BASF Canada	3	3.4, 3.5, 3.8
Nutrien	2	2.4
Teranga Gold	2	2.1, 2.3, 2.4
Air Canada	3	3.4, 3.5, 3.8
Air Canada, Envtal Affairs	12	12.5
BlackBerry	13	13.1, 13.2, 13.3
Kinross Gold	7	7.1
Lucara Diamond Corp	12	12.5
TC Transcontinental	12	12.5
TC Energy	7	7.1, 7.a
Teck Resources Ltd.	3	3.2, 3.3, 3.d
TELUS	3	3.4, 3.5, 3.8

Table 11: References to UN SDGs by Selected Listed Canadian Organizations – Non-Businesses

Firm	SDG	Target
Acceler 2030	17	17.6,17.7, 17.19
Centre for Affordable Water and Sanitation Technology	6	6.1, 6.2, 6.a, 6.b
Lundin Foundation	8	8.1, 8.2, 8.3, 8.5, 8.9, 8.10
Operation Eyesight	3	3.2, 3.8, 3.c
Society for Canadian Women in Science and Technology	5	5.1, 5.2, 5.4, 5.5, 5.6, 5.A, 5.B, 5.C
WaterAid Canada	6	6.1, 6.2, 6.3, 6.4, 6.5

Table 10: References to UN SDGs by Selected Listed Canadian Organizations – Small-to-Medium Enterprises

Firm	SDG	Target
EM-ONE Energy Solutions	7	7.1, 7.2, 7.3
Umalia	17	17.7, 17.9, 17.16, 17.7
Ibex Academia	4	4.1, 43, 4.5, 4.6, 4.7
O Trade	1	1.1, 1.2, 1.3, 1.4,
R&G Strategic	17	17.14, 17.16, 17.17, 17.19
Sustainability Advantage	13	13.1, 13.2, 13.3
Ulula	8	8.5, 8.7, 8.8
Women on the Move	12	12.1, 12.2, 12.3, 12.4

CSA Group Research

In order to encourage the use of consensus-based standards solutions to promote safety and encourage innovation, CSA Group supports and conducts research in areas that address new or emerging industries, as well as topics and issues that impact a broad base of current and potential stakeholders. The output of our research programs will support the development of future standards solutions, provide interim guidance to industries on the development and adoption of new technologies, and help to demonstrate our on-going commitment to building a better, safer, more sustainable world.