



Climate
Disclosure
Standards
Board

Converging on Climate Risk: CDSB, the SASB, and the TCFD

The Emerging Alignment of Market-Based Approaches
to Climate-Related Financial Disclosure
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EXECUTIVE SUMMARY

After extensive deliberation and discussion, the Task Force on Climate-Related Financial Disclosures (TCFD) issued its final recommendations in June 2017, marking an important turning point for the resilience of global financial markets. As Task Force Chairman Michael R. Bloomberg has stated, “without effective disclosure of [climate-related] risks, the financial impacts of climate change may not be correctly priced—and as the costs eventually become clearer, the potential for rapid adjustments could have destabilizing effects on markets.”¹

Recognizing that climate-related financial reporting is an emerging and evolving endeavor with few well-established best practices, the Task Force’s recommendations provide a foundation to improve the ability of markets to properly assess and price climate-related risks and opportunities. Two organizations that participated in the dialogue, the Climate Disclosure Standards Board (CDSB) and the Sustainability Accounting Standards Board (SASB), are now in a unique position to build on that foundation, integrating the TCFD recommendations into their respective disclosure frameworks to advance the cause of addressing climate-related risk in the capital markets.

CDSB and the SASB—two of the most extensively referenced organizations throughout the TCFD recommendations, across both the core elements and supporting recommended disclosures—have, over time, each developed approaches for companies to use in identifying, assessing, and reporting their performance on climate-related issues. Working together, the SASB’s metrics and CDSB’s Framework for Reporting Environmental Information and Natural Capital and Climate Change Reporting Framework (together, the CDSB Framework) complement each other to ensure a company can easily integrate climate factors into a mainstream financial filing and fulfill the recommendations of the TCFD.

As this document will show, CDSB and the SASB’s approaches are already well-aligned with the recommendations of the Task Force. However, this paper also stands as a statement of agreement by CDSB and the SASB to further this harmonization, working to deliver a TCFD-ready framework to facilitate consistent, quality implementation.

Appendix V (Sample TCFD, CDSB, and SASB-Aligned Disclosures) illustrates this convergence, providing sample disclosures for a company in the oil and gas industry that follows the recommendations of the TCFD, satisfies the provisions of the SASB standard for that industry, and observes the principles and requirements of the CDSB Framework. As this example shows, the SASB standards are aligned with CDSB’s Framework and integrate TCFD guidance into an industry-specific approach, consistent with how climate-related impacts manifest in capital markets. Thus, where the TCFD’s supplemental guidance specifically addresses four financial and 19 non-financial industry groups, the SASB standards—supported by the CDSB Framework—provide a comprehensive set of TCFD-aligned disclosures for 79 industries.

As the TCFD, the Financial Stability Board (FSB), and the G20 help make the disclosure of material, climate-related financial information a mainstream market practice, the continued role of CDSB and the SASB as standard-setting organizations becomes crucial. These organizations provide companies with the practical tools they need to identify, assess, and report information on climate-related risks and opportunities in a way that not only upholds TCFD recommendations, but is also cost-effective for preparers and useful for decision makers. Through this ongoing collaboration, CDSB and the SASB pledge to establish a unified approach to climate-related financial disclosures that benefits companies, investors, and the economy at large.

¹ TCFD, “Recommendations of the Task Force on Climate-related Financial Disclosures” (December 2016).

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INTRODUCTION

At its most fundamental level, economics is about the relationship between people and resources. People are both producers and consumers of resources, which often include natural materials and components (i.e., natural capital), such as air, water, soil, energy, and biodiversity. An efficient and thriving economy, therefore, goes hand-in-hand with at least two things: informed participants and stable and resilient ecosystems.

In recent years, investors have developed an increasingly sophisticated understanding of the interconnect- edness of economic and environmental systems. Although this link has always been present, participants in today's financial markets face rapidly evolving risks and opportunities related to climate change, which institutional investors have called "one of the greatest long-term risks we face in our portfolio,"² the mitigation of which is "essential for the safeguarding of our investments."³

2 Office of the New York State Comptroller, "New York State Comptroller DiNapoli Statement in Response to Majority Support at Exxon Annual Meeting" (May 31, 2017).

3 "Letter From Global Investors to Governments of the G7 and G20 Nations" (May 8, 2017), accessed June 5, 2017, at <http://aigcc.net/wp-content/uploads/2017/05/22-May-Updated-Global-Investor-Letter-to-G7andG20-Governments.pdf>.

Increasing Investor Attention

Indeed, as climate-related uncertainty has increased, large investors—such as pension funds, investment funds, insurance companies, foundations, endowments, and others—have begun to explore various approaches to managing this risk and capitalizing on its upside potential. For example, the Investor Network on Climate Risk and Sustainability (INCR), a U.S.-based group of more than 130 institutional investors representing more than \$17 trillion in assets under management, is working to advance best practices, corporate engagement strategies, and policy solutions related to climate risk.⁴ In Europe, similar work is being done by the Institutional Investors Group on Climate Change (IIGCC), a network of more than 136 members representing approximately €18 trillion in assets.⁵ Globally, a group of 409 institutional investors collectively managing more than \$24 trillion in assets has issued a statement pledging their commitment to meaningfully address climate risk and calling on international governments for stronger political leadership and more ambitious policies.⁶

However, asset owners and managers have often struggled to apply traditional risk-management tools in the context of climate change due to a persistent lack of accessible, high-quality information on how corporations are managing the issue. This problem is exacerbated by inconsistency both across and within global disclosure regimes. First, mandatory reporting requirements vary considerably from one jurisdiction to another. For example, although an increasing number of jurisdictions have introduced mandatory requirements for the disclosure of environmental information, each involves its own approach (i.e.,

rules- or principles-based), concept of materiality, threshold for disclosure, and presentation.⁷ Secondly, even within a given jurisdiction, disclosure quality—in terms of comparability, reliability, timeliness, and other characteristics important to usability—can vary dramatically. For example, in the U.S., although companies are increasingly acknowledging the existence of, or the potential for, material impacts related to climate change, 40 percent of possible disclosures consist of boilerplate language and less than 20 percent uses quantitative metrics. Even in those cases where metrics are used, they are not standardized, resulting in data that lacks comparability across peer companies.⁸

TCFD: Promoting Alignment

It is against this backdrop that, in 2015, the Financial Stability Board (FSB)—at the request of G20 leaders—launched its Task Force on Climate-Related Financial Disclosures (TCFD or Task Force). The Task Force's remit was to help companies better understand what financial markets need from disclosure in order to measure and manage climate risks. In keeping with this mission, in June 2017, the TCFD finalized a set of recommendations for voluntary company financial disclosures that clarifies what may constitute material and relevant climate-related risks, establishes principles for effective disclosure, proposes key disclosures across four thematic areas (governance, strategy, risk management, and metrics and targets), and provides both general and sector-specific guidance to support implementation.⁹ These recommendations will be covered in greater detail in later sections of this document.

4 Ceres website, "Investor Network on Climate Risk and Sustainability," accessed June 5, 2017, at <https://www.ceres.org/networks/ceres-investor-network>.

5 IIGCC website, "Membership," accessed June 5, 2017, at <http://www.iigcc.org/membership>.

6 Global Investor Statement on Climate Change (September 2014).

7 See, for example: United Kingdom, The Companies Act 2006 (Strategic Report and Directors' Report) Regulations 2013 (SI 1970), available from: www.legislation.gov.uk/uk/si/2013/1970/made; Denmark, Financial Statements Act 2008 (2013), Copenhagen, available from: www.retsinformation.dk/Forms/R0710.aspx?id=158560; Institute of Directors in Southern Africa (2009) King code of governance for South Africa King III, available from: http://www.iodsa.co.za/resource/collection/94445006-4F18-4335-B7FB-7F5A8B23FB3F/King_Code_of_Governance_for_SA_2009_Updated_June_2012.pdf; France, LOI no 2010-788 du 12 Juillet 2010 portant engagement national pour l'environnement Grenelle II (2010), Paris, available from: <https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000022470434>; Canadian Securities Administrators (2010) Environmental reporting guidance, available from: www.securities-administrators.ca/aboutcsa.aspx?id=928; U.S. Securities and Exchange Commission (2010), Commission guidance regarding disclosure related to climate change, available from: www.sec.gov/rules/interp/2010/33-9106.pdf.

8 Sustainability Accounting Standards Board, The State of Disclosure 2016 (December 2016).

9 TCFD, "Final Report: Recommendations of the Task Force on Climate-related Financial Disclosures" (June 2017), available from: <https://www.fsb-tcfd.org/publications/final-recommendations-report/>.

Importantly, by design, the TCFD’s recommendations also promote alignment across a variety of existing disclosure regimes, frameworks, and initiatives, including those focused on both financial and non-financial reporting. As the TCFD report states, “The Task Force’s recommendations provide a common set of principles that should help existing disclosure regimes come into closer alignment over time.”¹⁰ Among those initiatives, two in particular—the Climate Disclosure Standards Board (CDSB) and the Sustainability Accounting Standards Board (SASB)—have produced, and are in the process of developing further, tools for climate-related financial disclosures that incorporate and align closely to the recommendations and supporting recommended disclosures of the TCFD. Furthermore, both organizations are committed to carrying the TCFD’s work forward by refining their reporting frameworks with the goal of increased harmonization. Specific points of alignment and plans to enhance compatibility among these approaches will be covered in greater detail in the following sections.

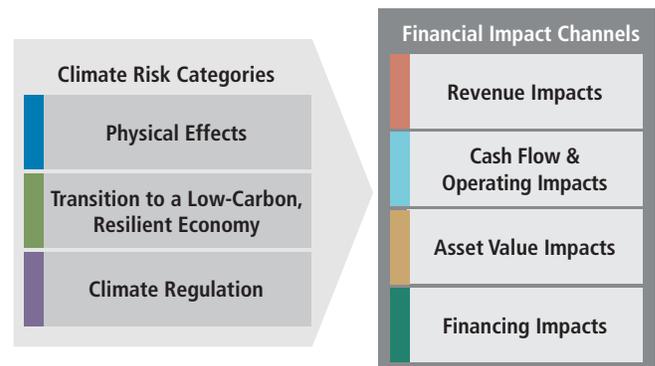
In part, this natural integration of the work of CDSB, the SASB, and the TCFD springs from the ample common ground they occupy philosophically and technically. For example, the three organizations share identical or complementary perspectives on a variety of key issues, including their view of materiality, their accordance with existing regulation, and their vision of traditional financial disclosures and climate-related financial disclosures living side-by-side in mainstream financial filings.

FINANCIAL MATERIALITY

All three organizations share a financially-based view of the concept of materiality—in other words, they primarily consider those climate-related

impacts related to the financial condition or operating performance of a company.¹¹ For example, climate change may affect an apparel company’s ability to source cotton, a crop that is vulnerable to shifting weather patterns.¹² It may impact the riskiness of a commercial bank’s loan portfolio as carbon-intensive borrowers’ own risk exposures threaten their ability to repay or refinance.¹³ And it is likely to influence automakers to more rapidly develop alternative-fuel vehicles in response to shifting consumer demand patterns.¹⁴

FIGURE 1. THE SASB CLIMATE RISK FRAMEWORK



The framework above (see Figure 1), which is developed more fully in the SASB’s Climate Risk Technical Bulletin, illustrates how different types of climate risk may have impacts through a variety of financial channels.¹⁵

This approach—viewing climate risk through the lens of financial materiality—results in a more focused set of disclosures that are tailored to the needs of economically motivated stakeholders such as investors, lenders, insurers, management,

10 TCFD, “Recommendations of the Task Force on Climate-related Financial Disclosures” (December 2016).
 11 The SASB observes the U.S. Supreme Court definition of materiality, a foundational legal concept that underpins much of the federal securities laws, the related disclosure requirements, and the SEC’s enforcement actions. CDSB adopts and adapts the definition of and approach to materiality expressed in the International Accounting Standards Board’s (IASB’s) Conceptual Framework. Meanwhile, to ensure as much compatibility as possible with national disclosure requirements for financial filings, the TCFD encourages companies to determine the materiality of climate-related issues (particularly with respect to disclosures made under its Strategy and Metrics & Targets recommendations) in a way that is consistent with how they determine the materiality of other information included in their financial filings.
 12 Sustainability Accounting Standards Board, Apparel, Accessories & Footwear Industry Research Brief (Sept. 23, 2015).
 13 Sustainability Accounting Standards Board, Commercial Banks Industry Research Brief (Feb. 25, 2014).
 14 Sustainability Accounting Standards Board, Automobiles Industry Research Brief (Sept. 24, 2014).
 15 Appendix II of this document illustrates how the SASB’s climate risk framework relates to the corresponding framework set out in the TCFD recommendations.

and regulators. Although other stakeholders have legitimate interests and information needs, CDSB, the SASB, and the TCFD recognize that climate-related financial disclosures are most useful to economic decision-makers when they are free from immaterial clutter and avoid unnecessary or duplicative detail.

Reporting of GHG Emissions

Although CDSB, the SASB, and the TCFD share very similar conceptions of materiality, one key difference warrants mention: the way in which each organization treats greenhouse gas (GHG) emissions, a leading contributor to climate change.

According to the current CDSB Framework, GHG emissions from operations, entities and activities within the financial reporting boundary of the organization (Scope 1 and 2) are considered material to all companies in all sectors and should be reported accordingly.

On the other hand, GHG emissions reporting under the TCFD recommendations and the SASB standards is subject to the company's own assessment of materiality. For example, the SASB's sustainability accounting standards were developed in accordance with an extremely high standard of materiality—that of the U.S. Supreme Court—resulting in a unique set of metrics for each of 79 industries. This translates to GHG emissions being considered a “likely material” disclosure in just 23 of 79 industries. (In fact, data from CDP indicates that just seven industries account for 85 percent of reported Scope 1 GHG emissions.†)

While this distinction represents an important nuance, it does not hinder the ability of the CDSB Framework and the SASB standards to function together in support of the TCFD recommendations. Furthermore, in refreshing its Framework to better align with the TCFD recommendations, CDSB will consider the possibility of requiring GHG emissions disclosure only when material, as well as the opportunity to leverage the SASB's work as a means of determining the industries in which materiality is likely.

† Based on SASB analysis using CDP data pulled from the Bloomberg Professional Service in June 2016, for calendar year 2014 and organized by SICs industry. High-impact industries include Airlines, Chemicals, Construction Materials, Iron & Steel Producers, Metals & Mining, Oil & Gas Exploration and Production, and Electric Utilities. Note that not all companies in every industry report data on GHG emissions to CDP.

EXISTING REGULATION

The TCFD “recommendations are designed to leverage, rather than replace, existing disclosure regimes.”¹⁶ Like CDSB and the SASB, the Task Force explicitly “sought to balance the needs of

the users of disclosures with the challenges faced by the preparers.”¹⁷ One result of this effort is that all three organizations are focused on principles-based guidance, frameworks, metrics, and other tools that are broadly applicable across jurisdictions within existing disclosure requirements, meaning their implementation places no additional regulatory burden on corporate issuers. Rather, the resources provided by CDSB, the SASB, and the TCFD are intended to help companies comply more effectively with existing disclosure obligations.

As the Task Force has pointed out, the dearth of high-quality climate-related financial information is due not to a lack of regulatory requirements, but rather to the absence of useful, well-established “best practices” for its disclosure. “In most G20 jurisdictions,” the recommendations explain, “companies with public debt or equity have a legal obligation to disclose material risks in their financial reports—including material climate-related risks. However, the absence of a standardized framework for disclosing climate-related financial risks makes it difficult for organizations to determine what information should be included in their filings and how it should be presented.”¹⁸ The work of CDSB and the SASB, in alignment with the TCFD's recommendations, helps companies make those determinations and supply the capital markets with material, decision-useful information about their management of climate-related risks and opportunities.

MAINSTREAM FINANCIAL FILINGS

All three organizations believe material climate-related financial disclosures should be included in existing channels of financial reporting, such as mainstream financial filings (e.g., in Forms 10-K, 20-F, and 40-F in the U.S.; or in annual reports and, more specifically, within the strategic report in the U.K.). By integrating this information with traditional financial statements and supporting disclosures, companies and their investors can draw clearer links between material climate-related risks and opportunities and their financial impacts.

¹⁶ Mark Carney, “Remarks on the launch of the Recommendations of the Task Force on Climate-related Financial Disclosures,” Bank of England (December 14, 2016).

¹⁷ TCFD, “Recommendations of the Task Force on Climate-Related Financial Disclosures” (December 2016).

¹⁸ Ibid.

Moreover, CDSB, the SASB, and the TCFD have produced frameworks, metrics and recommendations that are designed to be used for compliance with existing mainstream reporting requirements, such as the requirement to disclose principal risks (extending to climate risk where appropriate). Such communication promotes a shared understanding and reduces information asymmetries between company management and financially motivated market participants attempting to incorporate climate-related risks and opportunities as a consideration in their investment, credit, and underwriting decisions.

Although additional reporting channels—such as sustainability reports, corporate websites, surveys and questionnaires—may be appropriate for other stakeholders or as an interim step on the path toward disclosure in mainstream financial filings, they present problems for shareholders and other users of financial filings. For example, the disjointed placement of material information creates undue inefficiencies in information gathering and analysis, while the inclusion of immaterial information in these channels may obscure important events, trends, and insights, lowering the signal-to-noise ratio.

CDSB and SASB: Looking Ahead

Although the TCFD was charged with developing and issuing climate-related disclosure recommendations for global capital markets, it is not responsible for ensuring that companies have all the tools they need to easily implement them, nor is it equipped to do so. Therefore, this role must be filled by other market-focused organizations.

CDSB and the SASB, two organizations that participated in the Task Force's early engagement efforts, and which have long been working in this area, are now well positioned to help realize the Task Force's ultimate goal of furthering market understanding and evaluation of climate-related financial impacts, leading to more efficient risk-pricing and allocation of capital in the global

economy. As standards-setting organizations, CDSB and the SASB are committed to working together in carrying the Task Force's recommendations forward by weaving them into the fabric of their own disclosure guidance, tools, and resources, to the benefit of corporate issuers, investors, and financial markets at large.

ABOUT CDSB

The Climate Disclosure Standards Board (CDSB) is an international consortium of nine business and environmental non-governmental organizations. It was launched in 2007 at the annual meeting of the World Economic Forum to develop a global mainstream corporate reporting model to equate climate change and natural capital information with information about financial capital. CDP (formerly the Carbon Disclosure Project) provides the Secretariat for the CDSB board members. Like the SASB, CDSB supports the work of the TCFD and has committed to aligning its guidance materials to the TCFD recommendations, while supporting companies in the implementation process through its technical expertise. It has also submitted commentary and suggestions during the TCFD drafting process. Since its inception, CDSB has expanded its scope from climate-specific information to environmental and natural capital information, and will continue to work to ensure environmental and natural capital disclosure evolves with the same rigor as climate disclosure.

The SASB contributes to the work of the CDSB through its membership on the CDSB Technical Working Group and its representation on the Board.

ABOUT THE SASB

Established in 2011, the Sustainability Accounting Standards Board (SASB) is an independent standards-setting organization dedicated to enhancing the efficiency of the capital markets by fostering high-quality disclosure of material

sustainability information that meets investor needs. The SASB develops and maintains sustainability accounting standards—for 79 industries¹⁹ in 11 sectors—that help public corporations disclose material information to investors in annual SEC filings. SASB’s rigorous process, that includes evidence-based research and broad, balanced stakeholder participation, yields standards that are valued by investors and corporations alike because they are cost-effective and decision-useful. The SASB standards board comprises nine members with diverse backgrounds and expertise encompassing capital markets regulation and policy; investing; financial accounting; securities law; corporate finance; and sustainability. For more information, visit www.sasb.org and follow us [@SASB](https://twitter.com/SASB).

CDSB/SASB COLLABORATION

CDP and the SASB first entered a Memorandum of Understanding (MoU) in 2013, pledging to work together to promote greater understanding, visibility and support for the development of disclosure standards for climate change-related and sustainability issues.²⁰ Early efforts included the use of CDP data in the evidence-gathering phase of SASB’s process for setting provisional sustainability accounting standards, as well as technical assistance in referencing CDSB’s Climate Change Reporting Framework. Meanwhile, CDSB endeavored to align its principles, requirements and implementation guidance with the SASB standards and other resources.

Today, the two organizations continue in a cooperative agreement to leverage one another’s expertise in forging an effective solution for the reporting of environmental and natural capital information in general and climate-related information in particular. To further their alliance, they have pledged to support and incorporate the recommendations of the TCFD in their respective frameworks and metrics.

By building on the TCFD recommendations as a common foundation, the principles and requirements of the CDSB Framework, and the topics and metrics of the SASB standards, will more fully complement each other. Working in concert, they will enable companies to better meet the expectations of investors by more easily integrating material sustainability factors—including climate risks and opportunities—into mainstream financial filings.

¹⁹ Where traditional industry classification systems group companies by sources of revenue, the SASB’s approach considers the resource intensity of firms, and groups industries with like sustainability characteristics, including risks and opportunities, within SASB’s Sustainable Industry Classification System™ (SICS™) found at: <https://www.sasb.org/sics/>. SASB has proposed a number of amendments to SICS, and the revised classification system will go into effect when the standards are codified in early 2018. Proposed changes to SICS are on SASB’s website and the TA items proposed herein are based on the new classification.

²⁰ See CDP and SASB, “Memorandum of Understanding” (June 2013).

TCFD RECOMMENDATIONS

Recognizing that climate change poses considerable risk to the global financial system, the G20 Finance Ministers and Central Bank Governors tasked the Financial Stability Board (FSB) in April 2015 with investigating the issue and exploring options for mitigation and management. In November of the same year, the FSB established the TCFD, citing a need for improved corporate disclosure of climate-related information to support informed decision-making by investors, lenders, and insurance underwriters. In developing recommendations for such disclosure, the Task Force would ensure more stable, resilient markets over the medium and long term by facilitating a smoother transition—with less abrupt price adjustments—to a lower-carbon economy.

As an international body, the TCFD's 32 members were drawn from a diversity of advanced and emerging G20 economies and from a variety of organizations, including banks, insurance companies, asset managers, pension funds, non-financial companies, accounting and consulting firms, and credit rating agencies.²¹ In addition to member expertise, the Task Force's work was informed by robust stakeholder engagement, which involved extensive input from existing climate-related disclosure initiatives, including CDSB and the SASB. The TCFD issued its initial set of recommendations in December 2016. Following additional stakeholder outreach, final recommendations were released in June 2017.

The TCFD recommendations are designed to solicit consistent, decision-useful, forward-looking

information on the material financial impacts of climate-related risks and opportunities, including those related to the global transition to a lower-carbon economy. They are adoptable by all organizations with public debt or equity in G20 jurisdictions for use in mainstream financial filings.

The TCFD identified four core elements of climate-related financial disclosures, related to the following thematic areas:

- 1. Governance:** The organization's governance around climate-related risks and opportunities
- 2. Strategy:** The actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning
- 3. Risk Management:** The processes used by the organization to identify, assess, and manage climate-related risks
- 4. Metrics & Targets:** The metrics and targets used to assess and manage relevant climate-related risks and opportunities

These four core areas are supported by *recommended disclosures* (including scenario analysis) and *guidance* (both general and sector-specific), which will be discussed in greater detail below. The recommendations, disclosures, and guidance all rest on a set of underlying principles intended to facilitate high-quality, decision-useful disclosures even as the market's understanding of—and approach to—climate-related impacts evolves over time.

²¹ A full list of Task Force members can be found at: www.fsb-tcfid.org/about/

Fundamental Principles for Effective Disclosure

The TCFD’s recommendations were established on the bedrock of seven Fundamental Principles for Effective Disclosure, which the Task Force adopted not only to underpin its own work but also to “help guide current and future developments in climate-related financial reporting.”²² Those principles, discussed in more detail below, are closely aligned with the foundational concepts of both CDSB²³ and the SASB²⁴ (see Table 1).

Principle 1: Disclosures should represent relevant information

The TCFD recommendations state that organizations “should provide information specific to the potential impact of climate-related risks and opportunities on its markets, businesses, corporate or investment strategy, financial statements, and future cash flows.”

This principle is closely aligned with CDSB’s Guiding Principle 1, which encourages organizations to apply the concepts of relevance and materiality to climate-related disclosures in the same way they would to traditional financial information.²⁵

22 TCFD, “Final Report: Recommendations of the Task Force on Climate-Related Financial Disclosures” (June 2017).

TABLE 1. ALIGNMENT OF CDSB FRAMEWORK AND SASB METRICS WITH TCFD PRINCIPLES

TCFD	CDSB	SASB
Principles for Effective Disclosures Intended to “help achieve high-quality and decision-useful disclosures that enable users to understand the impact of climate change on organizations.”	Guiding Principles and Reporting Requirements Principles [P] designed to ensure that environmental information in mainstream reports is useful to investors, is correct and complete and supports assurance activities. Requirements [REQ] designed to encourage standardized disclosure of environmental information that complements and supplements other information in mainstream reports	SASB Criteria for Accounting Metrics Designed to ensure the delivery of material, decision-useful information to the capital markets in a way that is cost-effective
Disclosures should represent relevant information	[P1] Environmental information shall be prepared applying the principles of relevance and materiality	SASB metrics are applicable to most companies in the industry
Disclosures should be specific and complete	[P2] Disclosures shall be faithfully represented	SASB metrics are complete, capturing a fair representation of performance
Disclosures should be clear, balanced, and understandable	[P5] Disclosures shall be clear and understandable [P3] Disclosures shall be connected with other information in the mainstream report	SASB metrics are useful to decision-makers and neutral (free from bias)
Disclosures should be consistent over time	[P4] Disclosures shall be consistent and comparable	SASB metrics are comparable over time
Disclosures should be comparable among companies within a sector, industry, or portfolio	[P4] Disclosures shall be consistent and comparable	SASB metrics are comparable across peers within an industry
Disclosures should be reliable, verifiable, and objective	[P6] Disclosures shall be verifiable	SASB metrics are verifiable
Disclosures should be provided on a timely basis	[REQ 9] Disclosures shall be provided on an annual basis	SASB metrics are useful to decision-makers

23 CDSB, “CDSB Framework for Reporting Environmental Information and Natural Capital” (June 2015).

24 SASB, “Conceptual Framework” (February 2017).

25 CDSB, “CDSB Position Paper: Positions on relevance and materiality, organisational boundaries and assurance”

Climate-related information is material, the CDSB Framework points out, when “the environmental impacts or results it describes are, due to their size and nature, expected to have a significant positive or negative impact on the organisation’s financial condition and operational results and its ability to execute its strategy.” Furthermore, as the CDSB Framework establishes, materiality “is specific to the reporting organisation,” and therefore disclosures must be tailored to the specific practices and circumstances of the preparer.

Reporting organizations can fulfill these principles (of the TCFD and CDSB) using SASB standards,²⁶ which are specifically designed to yield information that is financially material, thereby capturing the industry-specific impacts of sustainability issues, including climate risk.²⁷ The disclosure topics contained in the SASB standards, including those related to climate risk, are selected in part based on their relevance across an industry, their potential to affect corporate value, their level of interest to investors, and how well they reflect the consensus of companies and investors with respect to materiality. Further, the SASB metrics are chosen in part based on their applicability to most companies in an industry, resulting in disclosures that capture the unique sustainability risks and opportunities that are characteristic of the industry, including those related to climate.

Principle 2: Disclosures should be specific and complete

The TCFD also recommends that an organization’s disclosures “should provide a thorough overview of its exposure to potential climate-related impacts,” including information regarding the nature and size of the impacts, the organization’s approach to managing the issue, and its performance thus far.

This principle is well-aligned with CDSB’s Guiding Principle 2, which states that disclosure is complete when it “includes all information that is necessary for an understanding of the matter that it purports to represent and does not leave out details that

could cause information to be false or misleading to users.” Recognizing that climate-related disclosures are sometimes made “under conditions of more uncertainty than financial information,” and therefore may be based on estimates and the judgment of management, the CDSB Framework requires that preparers identify incomplete information and clearly explain the nature and degree of any omissions, errors, or uncertainty.

Disclosures can satisfy these principles through the use of SASB standards, which include performance metrics that are chosen in part because they:

- Individually, or as a set, provide enough data and information to understand and interpret performance associated with all aspects of the sustainability topic
- Adequately and accurately describe performance related to the aspect of the disclosure topic they are intended to address, or are a sufficient proxy for performance on that aspect of the disclosure topic

Principle 3: Disclosures should be clear, balanced, and understandable

The TCFD recommendations further state that disclosures should communicate financial information in a way that “serves the needs of a range of financial sector users” across varying levels of sophistication. This requires reporting that is sufficiently detailed and granular for specialized users, while also providing concise, unbiased, narrative analysis for less advanced users.

This principle corresponds to elements of CDSB’s Guiding Principles 3 and 5. For example, the latter allows for the inclusion of complex, difficult, or overly technical information when it is necessary for understanding, but also promotes the use—wherever possible—of clear, concise, and straightforward disclosures that employ plain language enhanced by illustrations, graphs, and charts. Meanwhile, CDSB’s principle 3 encourages disclosure that is appropriately contextualized,

²⁶ See Appendix V for an example of climate-risk disclosure, tailored to a company in the oil and gas exploration and production industry, in a mock 10-K.

²⁷ For more information on the SASB’s approach to materiality, see its staff bulletin on the subject: SASB, “SASB’s Approach to Materiality for the Purpose of Standards Development,” Staff Bulletin No. SB002-01102017 (January 2017).

clearly linking climate-related information to organizational strategy and financial outcomes.

Preparers of financial disclosures can address these TCFD and CDSB principles by using SASB standards. The standards incorporate a mix of quantitative metrics (78 percent) and qualitative disclosures (22 percent), providing both performance data and narrative context. All SASB metrics are designed to meet the needs of a range of financial sector users by providing useful information to companies in managing operational performance on the associated topic and to investors in performing financial analysis or portfolio management. They are also designed to be free from bias and value judgment, so that they yield an objective disclosure of performance that investors can use regardless of their worldview or outlook.

Principle 4: Disclosures should be consistent over time

The TCFD also recommends that climate-related financial disclosures “should be consistent over time to enable users to understand the development and/or evolution of the impact of climate-related issues on the organization’s business.”

This principle is closely aligned with CDSB’s Guiding Principle 4, which establishes that disclosures shall be consistent and comparable. The CDSB Framework clarifies that even as best practices evolve in the marketplace, a given organization can achieve comparability over time by using a consistent set of performance measures and indicators, and reporting from them according to consistently applied standards, policies, and procedures. Further, in its Reporting Requirement 8, the CDSB Framework compels preparers to identify the regulatory, industry-specific, or financial frameworks, standards, guidelines, or other methods they have used to prepare and report climate-related information, along with either a confirmation that the methods have been used consistently from one reporting period to the next or an explanation of why and how changes have been made.

SASB metrics support these principles, as they are designed to be comparable over time, yielding primarily quantitative data that allows for year-to-year benchmarking. Additionally, the rigorous technical protocols that underpin the metrics facilitate consistent application across reporting periods.

Principle 5: Disclosures should be comparable among companies within a sector, industry, or portfolio

The TCFD recommendations also state that climate-related financial disclosures “should allow for meaningful comparisons of strategy, business activities, risks, and performance across organizations and within sectors and jurisdictions.” This requires a relatively granular level of detail and a convenient, standardized reporting channel, such as mainstream financial filings.

This principle is also aligned with CDSB’s Guiding Principle 4, which further states that disclosures should “enable a level of comparability between similar organisations ... and sectors.”

In addition to being comparable over time, SASB metrics are also designed to be comparable across organizations within a single reporting period, allowing for peer-to-peer benchmarking within an industry. This tailored approach is important, because climate risk manifests differently from one industry to the next. Again, SASB’s detailed technical protocols ensure that the standards are applied consistency from one company to the next.

Principle 6: Disclosures should be reliable, verifiable, and objective

The TCFD’s sixth principle states that climate-related financial disclosures should be reliably accurate, having been “defined, collected, recorded, and analyzed in such a way that the information reported is verifiable to ensure it is high quality.” Furthermore, it states that disclosures “should be based on objective data and use best-in-class measurement methodologies, which would include common industry practice as it evolves.”

The CDSB’s Guiding Principle 6 establishes the same concept, ensuring the information that forms the basis for disclosures is verifiable—which is to say it is characterized by “supporting evidence that provides a clear and sufficient trail from monitored data to the presentation of environmental information.” Additionally, in its Reporting Requirement 8, the CDSB Framework obligates preparers to describe data collection and preparation, including relevant controls or other quality assurance processes. Finally, although the Framework is focused on reporting rather than assurance, its provisions are designed to represent suitable criteria capable of supporting an assurance engagement. Its Reporting Requirement 12 establishes that when environmental information reported according to the framework is assured, the resulting assurance opinion should be included or cross-referenced in the reporting organization’s statement of conformance (Requirement 11).

Likewise, the SASB standards are specifically designed to be verifiable, supporting an effective system of internal control for the purposes of data verification and independent, third-party assurance. In addition to ensuring comparability across peers and time periods, the technical protocols that accompany SASB metrics are designed to form the basis for suitable criteria (as defined by the AICPA) in an external assurance engagement. In addition, because the SASB metrics are aligned wherever possible with other widely used reporting frameworks (e.g., CDP, GRI, U.S. EPA, OSHA, EEOC, etc.), in most cases they represent common industry practice. (See Appendix IV for an example of how the SASB standards are aligned with other initiatives, including the CDP and CDSB.) Thus, preparers of climate-related financial disclosures can leverage the SASB standards to readily satisfy TCFD and CDSB principles related to data quality, reliability, and verifiability.

Principle 7: Disclosures should be provided on a timely basis

The final TCFD principle states that material climate-related financial disclosures should be

delivered to users at least annually in mainstream financial filings, and calls for more timely updates in the case of a materially disruptive event.

Although the CDSB Framework includes no directly analogous Guiding Principle, its Reporting Requirement 9 ensures that climate-related information is made available to users on a timely basis—at least annually—in mainstream reports.

Likewise, the SASB standards support this principle in that they are designed specifically for inclusion in periodic mainstream financial filings (e.g., Forms 10-K, 20-F, and 40-F in the U.S.) to ensure timely delivery of material sustainability information—including climate-related financial disclosures—to the capital markets. Timeliness is an essential component of information that is useful, one of the key criteria for SASB’s sustainability accounting metrics.

Recommended Disclosures And General Guidance

As mentioned previously, the TCFD recommendations are organized by four thematic areas: governance, strategy, risk management, and metrics and targets. Wherever possible, the TCFD attempted to align its recommendations with existing voluntary and mandatory climate-related reporting frameworks, including CDSB and the SASB.

GOVERNANCE

Boards of directors and C-suite executives play an increasingly important role in addressing climate-related risks and opportunities. Accordingly, investors and other users of financial filings have a growing interest in developing a robust understanding of how an organization’s governance functions are involved in overseeing, assessing, and managing these issues.

Governance
Disclose the organization’s governance around climate-related risks and opportunities.
<p>Recommended Disclosures:</p> <ul style="list-style-type: none"> a) Describe the board’s oversight of climate-related risks and opportunities. b) Describe management’s role in assessing and managing climate-related risks and opportunities.

The TCFD’s recommendations with respect to governance are well-aligned with Reporting Requirement 3 of the CDSB Framework, which asserts that climate-related financial disclosures should “describe the governance of environmental policies, strategy and information.” As the framework explains, “successful environmental policies require the support and leadership of an organisation’s Board, or highest governing body.” Thus, the framework calls for reporting organizations to identify the committee responsible for climate-related policies, strategy, and information, and to explain how this responsibility cascades through the organization, including how management is held accountable or incentivized to effectively implement environmental policies, such as those related to climate risk. This corresponds closely to the TCFD’s recommended Governance disclosure (a).

Additionally, Reporting Requirement 1 of the CDSB Framework calls for organizations to “report management’s environmental policies, strategy and targets,” including information about how they are resourced and how performance is assessed. This is closely related to the recommended Governance disclosure (b).

STRATEGY

Many organizations are currently facing impacts from climate-related issues, and they are likely to increase over time, with important implications for businesses, strategy, and financial planning. Improved disclosure on the issues, their existing

and anticipated impacts, and the organizational outlook will help investors and other stakeholders better understand how strategic functions are likely to be impacted over the short, medium, and long term.

Strategy
Disclose the actual and potential impacts of climate-related risks and opportunities on the organization’s businesses, strategy, and financial planning where such information is material.
<p>Recommended Disclosures:</p> <ul style="list-style-type: none"> a) Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term. b) Describe the impact of climate-related risks and opportunities on the organization’s businesses, strategy, and financial planning. c) Describe the resilience of the organization’s strategy taking into consideration different climate-related scenarios, including a 2°C or lower scenario.

The TCFD recommendations call for such disclosure to help ensure that users of mainstream financial filings can establish informed expectations about an organization’s future performance. These strategy-related recommendations—which call for the identification of risks and opportunities, the description of related impacts, and the analysis of future scenarios—overlap considerably with aspects of the CDSB Framework’s Reporting Requirements 2, 4, and 6.

For example, Requirement 2 of the CDSB Framework calls for reporting organizations to identify and explain its “material current and anticipated environmental risks and opportunities,” which includes physical, regulatory, and other impacts of climate change. Further, it compels preparers to explain the implications of these impacts “in terms of operations, supply chain, business model, financial results, achievement of strategic objectives, etc.” This requirement is

closely analogous to the TCFD’s recommended Strategy disclosure (a).

Meanwhile, to satisfy the CDSB Framework’s Requirement 4, organizations must report quantitative and qualitative information reflecting the material sources of environmental impact from operations, entities and activities within the organization’s reporting boundary. Additionally, Requirement 6 asks that management summarize its “conclusions about the effect of environmental impacts, risks and opportunities on the organisation’s future performance and position.” This includes how climate-related risks and opportunities affect the organization’s capacity to innovate, execute its strategy and create value over time. Together, these disclosures (Requirements 4 and 6) provide information that is analogous to the TCFD’s recommended Strategy disclosure (b).

RISK MANAGEMENT

Although some organizations have begun to apply traditional enterprise risk management (ERM) processes to the identification, assessment, and management of climate-related risks, the practice is not yet widespread or well developed.²⁸ In the absence of a robust approach to monitoring and managing these risks, organizations may face unexpected impacts to their success, profitability, or even survival. Lacking reliable information about how these risks are managed, investors and other decision makers are unable to properly evaluate the risk profile of an organization or its securities. The TCFD recommendations therefore call for disclosure on climate-related risk management practices and how they are integrated into an organization’s overall ERM function.

Reporting Requirement 6 of the CDSB Framework necessitates the disclosure of management’s outlook regarding the material effects of climate-related risks, including a description of the process used to identify those risks—a parallel to the TCFD’s recommended Risk Management disclosure (a).

Risk Management
Disclose how the organization identifies, assesses, and manages climate-related risks.
<p>Recommended Disclosures:</p> <ul style="list-style-type: none"> a) Describe the organization’s processes for identifying climate-related risks. b) Describe the organization’s processes for managing climate-related risks. c) Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization’s overall risk management.

Approaches to assessing the materiality of climate-related risks are outlined in Guiding Principle 1. Plans for managing material risks—including climate-related risks—should be disclosed according to Reporting Requirement 1; and, according to Requirement 2, climate-related risks must be explained in terms of their broader implications for the business—e.g., operations, supply chain, business model, financial results, achievement of strategic objectives, etc. By fulfilling these requirements, an organization may also satisfy the recommended Risk Management disclosures (b) and (c).

METRICS & TARGETS

In addition to the more qualitative considerations related to governance, strategy, and risk management, organizations can benefit greatly from measuring and managing their performance on climate-related issues using metrics and targets. The TCFD recommendations encourage the disclosure of such information, which can help investors and other decision makers “better assess the organization’s potential risk-adjusted returns, ability to meet financial obligations, general exposure to climate-related issues, and progress in managing or adapting to those issues.”²⁹ Importantly, such data can also facilitate

28 WBCSD, “Sustainability and enterprise risk management: The first step towards integration” (January 2017).

29 TCFD, “Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures” (December 2016).

the apples-to-apples comparison of organizations within a given industry or sector.

Similarly, the CDSB Framework requires the disclosure of “qualitative and quantitative results” (Requirement 4) related to material sources of environmental impacts, which may include GHG and other emissions; energy generation, use, and consumption; land use, land-use change, and forestry activities; water use and consumption; and other measurements deemed material. This requirement is closely aligned with the TCFD’s recommended Metrics & Targets disclosures (a) and (b).

Metrics & Targets
Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.
<p>Recommended Disclosures:</p> <ul style="list-style-type: none"> a) Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process. b) Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks. c) Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.

Further, the framework requires organizations to disclose targets, timelines, and indicators (Requirement 1) against which its climate-related policies and strategies may be assessed. This requirement echoes the recommended Metrics & Targets disclosure (c).

Because SASB metrics are designed to capture industry-specific impacts that are reasonably likely to be material (according to evidence-based

research and market input), organizations can usefully incorporate these performance indicators into their strategy and risk management processes, using them for target-setting, benchmarking, and tactical performance management. The following section, which covers sector-specific guidance, includes examples of SASB metrics that can provide useful information to decision makers both inside and outside an organization.

Supplemental Guidance for Specific Sectors

In addition to its general recommendations, the TCFD also issued sector-specific guidance for preparers in financial and non-financial sectors it considers most likely to be affected by climate change and the transition to a lower-carbon economy. This guidance acknowledges “the need to consider the variability of climate-related impacts across and within different sectors and markets.”³⁰ The TCFD has encouraged organizations to provide metrics “tailored to their particular climate-related risks and opportunities,” and has suggested that “in determining the most relevant and useful metrics, organizations are encouraged to engage with their key stakeholders, including investors.”³¹

The supplemental guidance is closely aligned with the SASB’s approach to climate risk, which identifies the industry-specific impacts that are material to investors. Increasingly, investors understand that climate change has differentiated implications across a portfolio—for example, it is likely to affect a customer-facing professional services firm very differently than it will an upstream oil and gas exploration and production firm. Thus, today’s investors are looking to better understand the nature of their risk exposures in each industry, especially those industries in which risk is likely to have been uncompensated due to inadequate disclosure.

According to research by the SASB, climate risk is likely to have material impacts on companies in 72 of 79 industries, representing \$27.5 trillion,

30 TCFD, “Final Report: Recommendations of the Task Force on Climate-Related Financial Disclosures” (June 2017).

31 TCFD, “Recommendations of the Task Force on Climate-Related Financial Disclosures” (December 2016).

or 93 percent of U.S. equities by market capitalization.³² However, although climate risk is nearly ubiquitous, its impacts are diverse, and therefore require specialized disclosures. The SASB standards identify performance metrics that account for climate-related performance in a way that reflects each industry's unique perspective. Because of this, the TCFD referenced many SASB metrics in the draft of its sector-specific guidance.

FINANCIAL SECTORS

Because the concentration of carbon-related assets in the financial sector is both prevalent and poorly understood, much of the TCFD's sector-specific guidance for the financial sector is related to risk management. For example, the recommendations cite a number of relevant SASB metrics intended to provide insight into how different financial organizations integrate climate-related considerations into their lending practices, investment management, and advisory services. These include:

- **Commercial Banks:** In its draft supplemental guidance, the TCFD cited SASB metric FN0101-16, which calls for a discussion of the credit risk posed to a bank's loan portfolio by sustainability issues, including climate change.³³ Such disclosure is also aligned with the CDP Climate Change Information Request (CC5) and the CDSB Framework (REQ-02, Risks and opportunities).
- **Insurance:** The TCFD also cited SASB metric FN0301-17, which calls for a discussion of climate-related risks to the investment portfolio of an insurance company, including a description of how the organization "assesses and has identified the risks to its investment portfolio(s) presented by climate change."³⁴ Such disclosure is also aligned with the CDP Climate Change Information Request (CC5) and the CDSB Framework (REQ-02, Risks and opportunities).

- **Asset Management & Custody Activities:**

The TCFD cited SASB metric FN0103-15, which calls for a discussion of how climate risk is integrated into investment analysis and decisions, as well as how this integration intersects with the organization's fiduciary duties. Such disclosure is also aligned with the CDP Climate Change Information Request (CC2.2).

These are but a few examples of the overlap between the TCFD recommendations and the SASB metrics, which may be appropriate for use not only in satisfying recommendations related to Risk Management in the financial sector, but also to Strategy and Metrics & Targets.

NON-FINANCIAL SECTORS

The TCFD's sector-specific guidance also extends to a handful of non-financial industries which it expects to be most affected by the transition to a low-carbon economy, due to their material greenhouse gas (GHG) emissions, energy, and/or water dependencies associated with their operations and/or products. They include the following:

- **Energy Group:** Oil & Gas, Coal, Electric Utilities
- **Transportation Group:** Air Freight, Passenger Air Transportation, Maritime Transportation, Rail Transportation, Trucking Services, Automobiles, Related Transportation Infrastructure
- **Materials & Buildings Group:** Metals & Mining, Chemicals, Construction Materials, Capital Goods, Real Estate Management & Development
- **Agriculture, Food & Forest Products Group:** Beverages, Agriculture, Packaged Foods & Meats, Paper & Forest Products

Supplemental guidance for key non-financial sectors is largely focused in the thematic areas of Strategy and Metrics & Targets. For example,

32 Sustainability Accounting Standards Board, "Climate Risk Technical Bulletin" (October 2016).

33 SASB, Commercial Banks Sustainability Accounting Standard (February 2014).

34 SASB, Insurance Sustainability Accounting Standard (February 2014).

although the Task Force recommends all organizations describe their impact of climate-related risks and opportunities on businesses, strategy, and financial planning (a recommended Strategy disclosure), it asks organizations in these sector groups to disclose more detailed information related to potential impacts on revenues, expenditures, assets and liabilities, and capital planning and allocation. Similarly, the supplemental guidance for Metrics & Targets disclosures recommends the reporting of additional information related to these specific types of financial impact.

This guidance goes hand-in-hand with the SASB’s approach to standardizing industry-specific performance metrics, which is also focused on specific financial impacts related to an organization’s balance sheet, income statement, and cost of capital. As such, the TCFD referenced dozens of SASB metrics in its draft guidance as examples of performance indicators that satisfy its disclosure recommendations. For examples, see Table 2.

TABLE 2. EXAMPLES OF ALIGNMENT OF SASB METRICS WITH TCFD SUPPLEMENTAL GUIDANCE FOR NON-FINANCIAL SECTORS

Automobiles Industry (Transportation Group)				
Financial Impact	SASB Metric	Description	Unit of Measure	TCFD Rationale
Revenues	TR0101-09	Sales-weighted average passenger fleet fuel economy, consumption, or emissions, by region	Mpg, L/km, gCO ₂ /km, km/L	New technologies are needed to manage transition risk as demand grows for lower-carbon product alternatives. Organizations with stronger offerings of low-carbon alternative products in their core business will be better-positioned for success in the low carbon economy.
	TR0101-10	Number of (1) zero emission vehicles (ZEV) sold, (2) hybrid vehicles sold, and (3) plug-in hybrid vehicles sold	Vehicle units sold	
Assets/Liabilities	TR0101-01	Amount of total waste from manufacturing, percentage recycled	Metric tons (t), Percentage (%)	How an organization manages its product life cycle emissions and utilization of raw materials will provide insight into the organization’s ability to adapt to a low-carbon economy.
	TR0101-02	Weight of end-of-life material recovered, percentage recycled	Metric tons (t), Percentage (%)	
	TR0101-03	Average recyclability of vehicles sold, by weight	Percentage (%) by sales-weighted weight (metric tons)	

TABLE 2. EXAMPLES OF ALIGNMENT OF SASB METRICS WITH TCFD SUPPLEMENTAL GUIDANCE FOR NON-FINANCIAL SECTORS (CONT.)

Real Estate Development & Management Industry (Materials & Buildings Group)				
Financial Impact	SASB Metric	Description	Unit of Measure	TCFD Rationale
Revenues/Assets & Liabilities	IF0402-04	Percentage of eligible portfolio that (1) has obtained an energy rating and (2) is certified to ENERGY STAR®, by property subsector	Percentage (%) by floor area (ft ²)	Regulatory measures such as carbon pricing as well as transition to low-carbon properties may impact the financial viability of existing properties. Understanding the percentage certified as sustainable (against relevant indices) provides investors with an indication about the potential impact of regulatory measures and demand changes on earning capacity of real estate portfolios.
Expenditures	IF0402-02	Total energy consumed by portfolio area with data coverage, percentage grid electricity, and percentage renewable, each by property subsector	Gigajoules (GJ), Percentage (%)	The real estate industries are energy- and carbon-intensive industries in terms of the use of the properties. Understanding the levels of energy consumption by source provides an indication of the potential impacts of regulatory measures in relation to the use of certain energy sources and transition risks in a low-carbon economy scenario. In the transition to a low-carbon economy, the energy efficiency of properties provides investors with an indication of the vulnerability of the portfolio to transition risk and thus earning capacity of real estate portfolios.
Expenditures	IF0402-06	Water withdrawal data coverage as a percentage of total floor area and percentage in regions with High or Extremely High Baseline Water Stress, each by property subsector	Percentage (%) by floor area (ft ²)	Water stress can result in increased cost of supply, inability to deliver water to real estate tenants, and/or legislation to regulate water consumption. The percent withdrawn in high-water-stress areas informs the risk of significant costs or limitations to this service capacity.
Assets & Liabilities	IF0402-13	Area of properties located in FEMA Special Flood Hazard Areas or foreign equivalent, by property subsector	Square feet (ft ²)	Flooding risks can result in physical damage to properties, impacting their serviceability. Understanding the relative size of properties in high-flood-risk areas by subsector informs investors about potential changes to the earning capacity of real estate portfolios.

Agriculture Industry (Agriculture, Food & Forest Products Group)				
Financial Impact	SASB Metric	Description	Unit of Measure	TCFD Rationale
Expenditures	CN0101-06	(1) Total water withdrawn and (2) total water consumed, percentage of each in regions with High or Extremely High Baseline Water Stress	Cubic meters (m ³), Percentage (%)	Water stress can result in increased cost of supply, factual inability to produce, and/or legislation to regulate water withdrawal for production. The quantity of water consumed, and percent withdrawn in high-water-stress areas inform the risk of significant costs or limitations to production capacity.
Expenditures	CN0101-01	(1) Gross global Scope 1 emissions (2) Biogenic carbon dioxide (CO ₂) emissions	Metric tons (t) CO ₂ -e	(Relatively) high carbon emissions in the value chain are expected to result in regulations (including carbon prices) to drive lower emissions from products. This can result in a significant decrease in future earning capacity.

Again, the examples listed in Table 2 are only a small sample of the SASB metrics that are well-aligned with the TCFD's recommendations, as well as only a small sample of those specifically cited by the TCFD in its draft guidance. The SASB metrics referenced by the TCFD illustrate that the SASB's evidence-based, market-informed approach to metrics selection has achieved a high degree of alignment with other reporting frameworks. For example, in addition to alignment with the TCFD recommendations, many of the metrics also mirror requirements of the CDP and CDSB. For instance, disclosures made using the SASB metrics for the Automotive industry may also satisfy CDP Climate Change Information Request AU2.3a and CDSB Framework REQ-02 (TR0101-09), and CDP Climate Change Information Request items AU1.3a-c and CC3.2 (TR0101-10). Additionally, most of the cited SASB metrics represent indicators that are commonly used within their respective industries, such as the portfolio-level metric in the Real Estate industry (IF0402-04), which is aligned with the GRESB Real Estate Assessment (Q30.2, Q31). This harmonization of SASB metrics with existing industry approaches is in line with TCFD Principle 6, which calls for the use of best-in-class measurement methodologies, such as those that constitute common industry practice.

A sample of the SASB's provisional, industry-specific, climate-related metrics is referenced in Appendix IV, linked with type of impact and indicating alignment with other reporting frameworks.

CDSB AND SASB: MOVING FORWARD

The TCFD's recommendations build on the work of many other organizations, as evidenced by numerous cross-references to existing reporting regimes, including CDSB and the SASB. At the same time, however, the Task Force has set the stage for future work,³⁵ establishing a foundational set of principles and recommendations around which the climate-reporting ecosystem can coalesce. In its recommendations, the TCFD explicitly "encourages standard setting bodies to support adoption of the recommendations and alignment with the recommended disclosures."³⁶

Companies and other organizations can already use the CDSB Framework and the SASB sustainability accounting standards to prepare for and help fulfill the TCFD recommendations. As this paper has established, these approaches to climate reporting are already closely aligned with the recommendations, providing practical guidance for organizations as they integrate climate-risk disclosure into mainstream financial filings. Nevertheless, moving forward, both CDSB and the SASB are committed to harmonizing and developing their work more fully with the TCFD and each other.

By increasing their compatibility and aligning more closely with the TCFD recommendations, CDSB and the SASB aim to help ease the reporting burden on corporate issuers while also reducing confusion among investors and other users of financial information. When material, decision-useful information about climate-related risk is reported alongside relevant financial information in mainstream filings, the result will be more efficient, sustainable, and resilient capital markets.

What's Next

CDSB and the SASB plan to take the following approach as they move forward, with an eye toward increasing alignment with the TCFD recommendations:

- 1. Gap assessment:** CDSB and the SASB will identify existing points of alignment as well as opportunities for increased alignment with the TCFD recommendations. Where possible, changes will be proposed to the CDSB Framework and/or the SASB standards to enhance their compatibility with the recommendations.
- 2. Harmonization:** CDSB and the SASB will work to identify and articulate explicit linkages between the CDSB Framework and the SASB standards, ensuring that proposed changes enhance their compatibility not only with the TCFD recommendations but also with one another.
- 3. Public Comment:** All proposed updates to the CDSB Framework and SASB standards will be transparent and open to public comment, providing an opportunity for market input before they are finalized.

Acknowledgement of Key Differences

As this work moves forward, it is important to note key differences in the missions of CDSB, the SASB, and the TCFD, which may impose certain limitations on full alignment. These differences include the following:

- **Industry-Specificity:** Where the CDSB Framework and the TCFD recommendations are applicable across all sectors of the economy, each of the 79 SASB standards is designed for a specific industry,

³⁵ See, for example, Section E of the TCFD's final report, pp. 32-39.

³⁶ TCFD, "Final Report: Recommendations of the Task Force on Climate-Related Financial Disclosures" (June 2017).

identifying the unique financial impacts of various sustainability issues, including climate change. As a result, while CDSB's Framework currently calls for disclosure of GHG emissions across the board, the SASB standards only include GHG emissions as a metric for the 23 industries in which emissions are reasonably likely to have a material impact on financial condition or results of operations. In refreshing its Framework to better align with the TCFD recommendations, CDSB will consider the possibility of requiring GHG emissions disclosure only when material, as well as the opportunity to leverage the SASB's work as a means of determining the industries in which materiality is likely.

- Level of Focus:** The TCFD was established to fulfill a request by the G20 Finance Ministers that the FSB investigate "current and prospective financial stability risks from climate change and what might be done to mitigate them."³⁷ In other words, the TCFD's recommended disclosures are intended to "provide a source of data that can be analyzed at a systemic level, to facilitate authorities' assessments of the materiality of any risks posed by climate change to the financial sector, and the channels through which this is most likely to be transmitted."³⁸ As such, the ultimate goal of the Task Force is to facilitate a more robust understanding of the *systemic* climate-related risks facing the financial system at large, including the concentrations of carbon-related assets in the financial sector. On the other hand, the CDSB Framework and the SASB standards are primarily focused on *specific* risk—those residual, uncorrelated, and therefore theoretically diversifiable climate-related risks that are unique to a company or industry. Climate change, which

is likely to have material impacts on nearly every industry, clearly represents a *systematic* market risk—one that investors cannot diversify away from through traditional asset allocation or hedging strategies. Therefore, the company-level disclosures facilitated by CDSB and the SASB are intended to be decision-useful for investors in managing climate-related risk exposures at the portfolio level and in picking best-in-class performers at the fundamental level. Many of these disclosures—where they are aligned with the TCFD recommendations—are also likely to be useful, alone and in aggregate, to macroprudential regulators in monitoring and addressing systemic climate-related risks. However, because of this fundamental difference, alignment may not always be absolute.

- Jurisdictional Focus:** CDSB adopts and adapts the definition of and approach to materiality expressed in the International Accounting Standards Board's (IASB's) Conceptual Framework. Meanwhile, the TCFD encourages companies to determine the materiality of climate-related issues (particularly with respect to disclosures made under its Strategy and Metrics & Targets recommendations) in a way that is consistent with how they determine the materiality of other information included in their financial filings. Finally, the SASB has primarily focused its efforts on helping companies better meet the stringent disclosure requirements of U.S. capital markets. However, although the legal framework that underpins the SASB's approach to standard-setting is U.S.-based, the issues represented in those standards are global, cutting across geographic boundaries and jurisdictions. Therefore, the SASB standards are applicable to multinational

37 Carney, Mark "Breaking the tragedy of the horizon—climate change and financial stability," speech at Lloyd's of London, September 25, 2015.

38 FSB, "Proposal for a Disclosure Task Force on Climate-Related Risks" (November 9, 2015).

companies as well as those domiciled outside the U.S.³⁹

Although these differences may limit the ability of CDSB and the SASB to perfectly align their approaches with every aspect of the TCFD recommendations, any such restriction is expected to be minor, will be transparently noted and should not impede the ability of preparers to use the CDSB Framework and the SASB standards to satisfy the TCFD recommendations and supporting recommended disclosures.

SASB: Key Considerations

The SASB is currently undertaking a review of its 79 industry standards with the goal of bringing them into closer alignment with the TCFD recommendations. The SASB is evaluating each standard, topic, metric, and associated technical protocol in the context of the four thematic areas for which the Task Force provided recommendations—governance, strategy, risk management, and metrics and targets.

To achieve alignment, a combination of cross-cutting and industry-specific changes to the standards will be identified, vetted against the SASB Conceptual Framework, supported with additional research, and finally submitted for review and approval by the SASB’s Standards Board. Such changes may include the following:

- **Governance:** The SASB may revise its “Guidance on Accounting of Sustainability Topics” to incorporate guidance that parallels the TCFD’s recommended governance disclosures in a way that may be applied more broadly to all sustainability topics. When an impact related to climate change is material to a company’s business, that guidance would translate to disclosures that echo those recommendations to:
 - ◊ Describe the board’s oversight of climate-related risks and opportunities.

- ◊ Describe management’s role in assessing and managing climate-related risks and opportunities.

- **Strategy:** Similarly, the SASB may revise its “Guidance on Accounting of Sustainability Topics” to include guidance that is analogous to the Task Force’s recommended strategy disclosures but may also be applied to sustainability topics other than climate risk. When climate risk is material for a given industry, the guidance would structure discussion associated with the relevant disclosure(s) per the TCFD’s recommendations to:
 - ◊ Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term.
 - ◊ Describe the impact of climate-related risks and opportunities on the organization’s businesses, strategy, and financial planning.

Meanwhile, the SASB may add new or revise existing relevant quantitative and/or qualitative metrics (see the SASB Climate Bulletin for a comprehensive list of climate-related metrics included in the provisional SASB standards) and/or their associated technical protocols to include management’s discussion of the potential impacts on company performance of a 2°C scenario, including impacts to the organization’s businesses, strategy, and financial planning. This or a similar change would better align the standards with the TCFD’s final recommended strategy disclosure:

- ◊ Describe the resilience of the organization’s strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.

³⁹ Across 79 industries, the SASB standards reference hundreds of industry-specific metrics and associated technical protocols—including frameworks, standards, regulations, certifications, and definitions—that have been developed, established, or administered by a variety of global organizations, including CDP, CDSB, WBCSD, WHO, OECD, GRI, and many others. In certain instances, the concepts underpinning specific disclosure topics may be inherently tied to certain regions—for example, issues such as diversity and nutrition may have a nationally or culturally-specific context. In such cases, the SASB attempts to acknowledge regional variation by citing international equivalents, as appropriate. However, the SASB recognizes that the standards may need to be further refined to suit different markets in various contexts and is committed to taking this work forward.

- **Risk Management:** The SASB may also revise its “Guidance on Accounting of Sustainability Topics” to help structure management’s discussion related to sustainability metrics, including climate-related metrics, in a way that addresses the TCFD’s recommended risk management disclosures, which include the following:
 - ◇ Describe the organization’s processes for identifying and assessing climate-related risks.
 - ◇ Describe the organization’s processes for managing climate-related risks.
 - ◇ Describe how processes for identifying, assessing, and managing climate-related risks and opportunities are integrated into the organization’s overall risk management.

- **Metrics and Targets:** The SASB will analyze all the climate-related topics and metrics in its standards against the six “risk” categories and five “opportunity” categories outlined by the TCFD to determine whether additions or revisions may be necessary and appropriate. This analysis will aim to better align the standards with the Task Force’s recommended disclosure. Changes under consideration would encourage companies to:

- ◇ Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process.

For a detailed example of SASB’s approach to performing this gap analysis, see Appendix III, which details (a) how each of the SASB’s general climate-related issue categories are mapped to the TCFD risk/opportunity categories, and (b) how that mapping will be used to identify potential areas for enhanced alignment. Based on this analysis, the SASB will identify the following:

- ◇ Areas where the SASB and TCFD frameworks are currently aligned (*no changes required*)

- ◇ Areas where alignment may be improved (*changes to be proposed in the SASB’s upcoming technical agenda*)
- ◇ Areas where additional research may be required (*items to be considered for inclusion on the SASB’s research agenda*)

Notably, the SASB is unlikely to consider specific changes to its standards related to the disclosure of GHG emissions. Because of the SASB’s materiality-driven, industry-specific approach, the existing standards include Scope 1 emissions only where they are reasonably likely to have a material impact on the financial condition or operating performance of companies in an industry. Therefore, in terms of Scope 1 emissions, the SASB standards and TCFD recommendations are in alignment. However, this is unlikely to extend to the reporting of Scope 2 and 3 emissions.

For industries that indirectly contribute to greenhouse gas emission through their use of purchased electricity, the SASB does not recommend disclosure of Scope 2 emissions. Instead the standards include metrics related to understanding the amount, type (i.e., conventional or renewable), and source (i.e., self-generated or purchased) of energy. Based on its research and stakeholder engagement, the SASB has concluded that these measures provide a better understanding of potential material risks related to indirect emissions than would a Scope 2 emissions figure.

Finally, for industries that indirectly contribute to GHG emission upstream (e.g., from purchased materials processing and transportation), downstream (e.g., from distribution and use of products), or in other ways (e.g., from employee commuting and business travel), the SASB does not recommend disclosure of Scope 3 emissions. Instead, where these emissions areas are likely to have material implications, the SASB standards include metrics directly related to performance in those areas.

As such, the SASB standards may not perfectly align with the following TCFD recommended disclosure:

- ◇ Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.

However, this potential asymmetry would not impair the ability of the SASB standards, the CDSB Framework, and the TCFD recommendations to be applied in a complementary way.

In its final recommended disclosure related to metrics and targets, the TCFD calls for organizations to:

- ◇ Describe the targets used by the organization to manage climate related risks and opportunities and performance against targets.

Once again, SASB will review its existing topics, metrics, and guidance, and may revise them as needed and as appropriate, in keeping with the principles and processes outlined in the SASB Conceptual Framework and Rules of Procedure. This may include establishing targets for climate-related disclosures where such targets adhere to the Criteria for Accounting Metrics established in the Conceptual Framework.

In addition to reviewing and aligning with the TCFD’s general recommendations, the SASB is also reviewing supplemental TCFD guidance for financial and non-financial sectors. Certain revisions to specific SASB standards based on this supplemental guidance may also arise. (The industries identified by the TCFD are matched with the applicable SASB industry standard in Appendix I.)

Lastly, while the TCFD intends its recommendations to apply to all sectors, the materiality-focused approach taken by the SASB⁴⁰ found that climate-related impacts are not likely to be material in all industries. Therefore, the provisional SASB standards include no climate-related disclosures for the following industries:

- Advertising and Marketing

- Consumer Finance
- Education
- Media Production and Distribution
- Professional Services
- Tobacco
- Toys and Sporting Goods

Based on the SASB’s approach to standards-setting, it is unlikely that the SASB will propose changes to standards for these industries based on the TCFD recommendations.

Like all changes to the SASB standards, those made to align with the TCFD recommendations will follow due process, including evidence-based research, transparent vetting, and review and approval by the expert-led Standards Board.

CDSB: Key Considerations

Going forward, CDSB plans to undertake an integrated, cross-institutional work program that will support successful uptake and implementation of the TCFD’s recommendations. Phases of this ongoing effort will involve developing practical and technical guidance and resources, which may include refreshing the CDSB Framework. Specific efforts to promote harmonization within the climate-reporting ecosystem may include the following:

- **Refreshing CDSB’s Climate Change Reporting Framework to align with the TCFD recommendations**, potentially merging with the CDSB Framework for Reporting Environmental Information & Natural Capital, and exploring explicit links with the SASB standards for the purpose of communicating to the market a single, best-practice, TCFD-ready framework to facilitate uptake of and consistent, high-quality implementation of the Task Force’s recommendations;
- **Drawing on and consolidating experience and resources** from CDP,

40 SASB, “SASB’s Approach to Materiality for the Purpose of Standards Development,” Staff Bulletin No. SB002-01102017 (January 2017).

CDSB, the SASB, and other climate-reporting initiatives—including the Global Reporting Initiative (GRI), the International Integrated Reporting Council (IIRC), the Principles for Responsible Investment (PRI), the World Business Council on Sustainable Development (WBCSD) and others—who collect evidence of reporting practice;

- **Drawing on related practice**, including from financial accounting, risk management and governance frameworks and codes (where relevant to the recommendations), as well as from developers of behavioral standards (such as ISO) that inform internal corporate practice (eventually reflected in external reports). For example, CDSB has produced “Unchartered Waters: how can companies use financial accounting standards to deliver on the TCFD’s recommendations?” a paper which is specifically designed to respond to the TCFD’s call for more work to be done on the alignment of financial reporting standards and climate change-related financial disclosure.⁴¹
- **Engaging specialist organizations to develop practical aspects of scenario analysis** (e.g., ERM and Carbon Tracker Initiative);
- **Leveraging existing networks** (e.g., WBCSD and the World Economic Forum) to understand financial and non-financial organizations’ needs for guidance and support; and
- **Involving the “custodians” of mainstream reporting practice**, such as the International Accounting Standards Board (IASB), the Financial Accounting Standards Board (FASB), the Committee of Sponsoring Organizations of the Treadway Commission (COSO), and others.

In the same collaborative spirit with which the CDSB undertakes all its work, these efforts will seek to offer a strategic perspective on how collaboration across the ecosystem of climate-related corporate reporting can be strengthened and sharpened to take maximum advantage of the opportunity and momentum presented by the issuance of the TCFD’s recommendations.

CDSB will also continue its engagement with the corporate sector globally and with regulators to further the technical understanding and practical application of the TCFD recommendations and promote the mainstreaming of high-quality climate disclosure.

Conclusion

The TCFD recommendations represent an important advancement in the global movement to include environmental, social, and governance data and information in mainstream company disclosures to the benefit of companies, investors, and the economy at large. CDSB and the SASB fully support the objectives of the TCFD and appreciate the important leadership and political will of the Task Force in raising the profile of climate-related risks and opportunities among mainstream participants in the financial system. Both CDSB and the SASB will continue working collaboratively to help companies deliver on the recommendations, providing the practical “how to” for implementation via an integrated, best-practice, TCFD-ready framework that enables consistent, quality implementation. As standard-setting organizations, CDSB and the SASB are ideally positioned to carry the TCFD’s work forward, facilitating increased alignment within the reporting landscape, streamlined guidance for issuers, more useful information for investors and other decision makers, and increased stability and resilience within the broader capital markets.

⁴¹ “Unchartered waters: how can companies use financial accounting standards to deliver on the Task Force on Climate-related Financial Disclosures’ recommendations?” (June 2017) was produced with Grant Thornton and is available here: http://cdsb.cdnf.net/sites/default/files/tcfd_and_financial_accounting_recommendations_v.1.pdf.

RESOURCES

Users of this guidance may also find value in the following resources.

SASB Climate Risk Technical Bulletin

<https://library.sasb.org/climate-risk-technical-bulletin/>

SASB Implementation Guide for Companies

<https://library.sasb.org/implementation-guide/>

SASB Mock 10-K Library

<https://library.sasb.org/mock-10-ks-select-sector/>

CDSB, *Uncharted Waters: how can companies use financial accounting standards to deliver on the TCFD's recommendations?*

http://cdsb.cdnf.net/sites/default/files/tcf_and_financial_accounting_recommendations_v.1.pdf

CDSB Climate Change Reporting Framework

http://www.cdsb.net/sites/cdsbnet/files/cdsb_climate_change_reporting_framework_edition_1.1.pdf

CDSB Framework for Reporting Environmental Information & Natural Capital

http://www.cdsb.net/sites/cdsbnet/files/cdsb_framework_for_reporting_environmental_information_natural_capital.pdf

CDSB, *Corporate climate disclosure schemes in G20 countries after COP21*

<http://cdsb.cdnf.net/sites/default/files/climate-disclosure-standards-board-climate-disclosure.pdf>

CDSB and the Association of Chartered Certified Accountants (ACCA), *Mapping the sustainability reporting landscape, lost in the right direction*

http://cdsb.cdnf.net/sites/default/files/acca_cdsb_mapping_the_sustainability_landscape_lost_in_the_right_direction.pdf

APPENDICES

Appendix I: TCFD Industries Mapped to SICS

The table below shows how the sector groups and industries identified by the TCFD correspond to those included in the SASB’s Sustainable Industry Classification System (SICS™).

TCFD Industry/Group	TCFD Group Industries	SASB Sector	SASB Industry
Banks	N/A	Financials	Commercial Banks
Insurance Companies			Investment Banking & Brokerage
Asset Owners			Mortgage Finance
Asset Managers			Insurance
Energy	Oil and Gas	Extractives and Minerals Processing	Asset Management and Custody Activities
			Oil and Gas – Exploration and Production
	Coal		Oil and Gas – Midstream
	Electric Utilities	Infrastructure	Oil and Gas – Refining and Marketing
			Oil and Gas – Services
			Coal Operations
Transportation	Air Freight	Transportation	Electric Utilities
	Passenger Air Transportation		Air Freight & Logistics
	Maritime Transportation		Airlines
	Rail Transportation		Marine Transportation
	Trucking Services		Rail Transportation
	Automobiles		Road Transportation
			Automobiles
	Auto Parts		
	Related Transportation Infrastructure	Car Rentals & Leasing	
			N/A
Materials and Buildings	Metals and Mining	Extractives and Minerals Processing	Metals and Mining
	Chemicals	Resource Transformation	Chemicals
	Construction Materials	Extractives and Minerals Processing	Construction Materials
	Capital Goods	Resource Transformation	Aerospace & Defense
			Electrical & Electronic Equipment
		Industrial Machinery & Goods	
		Containers & Packaging	
	Real Estate Management and Development	Infrastructure	Home Builders
			Real Estate Owners, Developers, & Investment Trusts
			Real Estate Services
Agriculture, Food, and Forest Products	Beverages	Food and Beverage	Non-Alcoholic Beverages
	Agriculture		Alcoholic Beverages
	Packaged Foods and Meats		Agricultural Products
			Tobacco
			Meat, Poultry, and Dairy
			Processed Foods
	Paper and Forest Products	Renewable Resources and Alternative Energy	Forestry & Logging
			Pulp & Paper Products

Appendix II: Mapping of SASB Climate Framework to TCFD Framework

The following table shows how the impacts (risks and opportunities) identified by the SASB Climate Risk Framework are mapped to those of the TCFD’s corresponding framework for the purposes of the SASB’s gap analysis.

TCFD Risks and Opportunities			SASB Climate Bulletin		
			Physical Effects	Transition to Low-Carbon, Resilient Economy	Climate Regulation
Risks	Transition Risk	Policy and Legal Risk			
		Technology Risk			
		Market Risk			
		Reputation Risk			
	Physical Risks	Acute Risk			
		Chronic Risk			
Opportunities		Resource Efficiency			
		Energy Source			
		Products and Services			
		Markets			
		Resilience			

Appendix III: TCFD Risk/Opportunity Coverage in SASB Standards

The following tables illustrate existing and potential alignment between the SASB standards and the TCFD recommendations. Table III-A shows where the TCFD has identified climate-related risk and how the SASB has addressed that risk, either in its provisional standards, its 2017 technical agenda, or its ongoing research agenda. Table III-B includes specific examples of proposed items on the SASB’s technical and research agendas. Technical agenda items will be reviewed for approval by the SASB in 2017, while research agenda items are ongoing. For example, the SASB is not immediately integrating the TCFD recommendation for asset management companies to disclose the carbon footprint of their assets under management because such disclosure is controversial, costly, and may create unintentional consequences of creating other sustainability risks in a portfolio. For these reasons and others, the SASB’s due process requires that additional research be conducted before the issue may be addressed in the standards, if appropriate.

Table III-A: SASB Climate Risk Mapping

SECTOR	INDUSTRIES	CLIMATE RISK CATEGORY			LEGEND	
		Physical Effects	Transition to a Low Carbon, Resilient Economy	Climate Regulation	Climate risk exposure	
Health Care	Biotechnology & Pharmaceuticals	Dark Red	Grey		Potential research agenda item	Dark Red
	Medical Equipment & Supplies	Dark Red	Red			
	Health Care Delivery	Red	Dark Red		Technical agenda item proposed	Dark Red
	Health Care Distribution					
	Managed Care	Dark Red			Disclosure included in provisional standard	Dark Red
	Drug Retailers		Dark Red			
Financials	Commercial Banks		Red		Potential research agenda item	Dark Red
	Investment Banking and Brokerage		Red			
	Asset Management and Custody Activities		Red		Technical agenda item proposed	Dark Red
	Consumer Finance					
	Mortgage Finance	Red			Disclosure included in provisional standard	Dark Red
	Security and Commodity Exchanges		Grey			
	Insurance	Red	Red			
Technology & Communications	EMS and ODM	Dark Red	Dark Red		Potential research agenda item	Dark Red
	Software and IT Services	Dark Red	Dark Red			
	Hardware				Technical agenda item proposed	Dark Red
	Semiconductors	Dark Red	Dark Red	Dark Red		
	Telecommunication Services	Dark Red	Dark Red		Disclosure included in provisional standard	Dark Red
	Internet and Media Services	Dark Red	Dark Red			
Extractives & Minerals Processing	Coal Operations	Dark Red	Dark Red	Dark Red	Potential research agenda item	Dark Red
	Construction Materials	Dark Red	Grey	Dark Red		
	Iron & Steel Producers	Dark Red	Grey	Dark Red	Technical agenda item proposed	Dark Red
	Metals & Mining	Dark Red	Grey	Dark Red		
	Oil & Gas - Exploration & Production	Dark Red	Red	Red	Disclosure included in provisional standard	Dark Red
	Oil & Gas - Midstream			Red		
	Oil & Gas - Refining & Marketing	Dark Red	Dark Red	Dark Red		
Oil & Gas - Services	Dark Red	Dark Red	Red			
Transportation	Automobiles	Dark Red	Grey		Potential research agenda item	Dark Red
	Auto Parts	Dark Red	Dark Red			
	Airlines	Grey	Grey	Grey	Technical agenda item proposed	Dark Red
	Air Freight & Logistics	Grey	Grey	Grey		
	Car Rentals & Leasing	Dark Red		Grey	Disclosure included in provisional standard	Dark Red
	Cruise Lines	Grey	Dark Red	Dark Red		
	Marine Transportation	Grey	Dark Red	Grey		
	Rail Transportation	Grey	Dark Red	Grey		
	Road Transportation	Grey	Grey	Grey		

TABLE III-A: SASB CLIMATE RISK MAPPING (CONT.)

SECTOR	INDUSTRIES	CLIMATE RISK CATEGORY		
		Physical Effects	Transition to a Low Carbon, Resilient Economy	Climate Regulation
Services	Advertising & Marketing			
	Casinos & Gaming			
	Education			
	Hotels & Lodging			
	Leisure Facilities			
	Media & Entertainment			
	Professional & Commercial Services			
Food & Beverage	Agricultural Products			
	Alcoholic Beverages			
	Food Retailers & Distributors			
	Meat, Poultry & Dairy			
	Non-Alcoholic Beverages			
	Processed Foods			
	Restaurants			
	Tobacco			
Resource Transformation	Aerospace & Defense			
	Chemicals			
	Containers & Packaging			
	Electrical & Electronic Equipment			
	Industrial Machinery & Goods			
Consumer Goods	Apparel, Accessories & Footwear			
	Appliance Manufacturing			
	Building Products & Furnishings			
	E-Commerce			
	Household & Personal Products			
	Multiline & Specialty Retailers & Distributors			
	Toys & Sporting Goods			
Renewable Resources & Alternative Energy	Biofuels			
	Forestry Management			
	Fuel Cells & Industrial Batteries			
	Pulp & Paper Products			
	Solar Technology & Project Developers			
	Wind Technology & Project Developers			
Infrastructure	Electric Utilities & Power Generators			
	Engineering & Construction Services			
	Gas Utilities & Distributors			
	Home Builders			
	Real Estate			
	Real Estate Services			
	Water Utilities & Services			
	Waste Management			

LEGEND	
	Climate risk exposure
	Potential research agenda item
	Technical agenda item proposed
	Disclosure included in provisional standard

Table III-B: Climate-Related Items Under Consideration for the SASB Technical and Research Agendas

Sector	Industry	Agenda Type	Climate Risk	Summary of Actions
Health Care	Biotechnology & Pharmaceuticals	Research	Transition to a Low Carbon, Resilient Economy	Conduct additional research regarding how companies are managing climate change impacts on disease prevalence
Health Care	Health Care Delivery	Technical	Physical Effects	Review and possibly revise metrics to address emergency preparedness
Finance	Commercial Banks	Technical	Transition to a Low Carbon, Resilient Economy	Review and possibly revise metrics related to loan exposure by specific industries exposed to climate transition risk to all industries
Finance	Investment Banking & Brokerage	Technical	Transition to a Low Carbon, Resilient Economy	Revise metric related to exposure to ESG risks, including climate change, to improve the quality of the information generated by the standard
Finance	Asset Management	Technical	All	Revise metric regarding proxy voting and include issuer engagement to improve the quality of the information generated by the standard
Finance	Asset Management	Research	Transition to a Low Carbon, Resilient Economy	Conduct additional research regarding the disclosure of the carbon footprint of assets under management to ensure the decision-usefulness and cost-effectiveness of the information generated by the standard
Finance	Mortgage Finance	Technical	Physical Effects	Review and possibly revise metric to improve the global applicability of the disclosure to capture physical risk and loan exposure due to flooding
Finance	Security & Commodity Exchangers	Research	Transition to a Low Carbon, Resilient Economy	Conduct additional research regarding the decision-usefulness of information related to the offering of ESG-focused investible products, including the consideration and inclusion of climate-specific risks or opportunities
Finance	Insurance	Technical	Physical Effects	Review and possibly revise standard to improve the quality of disclosures related to modeling, reinsurance and pricing of climate-change related impacts to improve the quality of the information generated by the standard
Finance	Insurance	Technical	Transition to a Low Carbon, Resilient Economy	Consider the addition of a metric to quantify invested assets by industry and asset class, including industries exposed to climate transition risk
Technology & Communications	Hardware	Research	Transition to a Low Carbon, Resilient Economy	Conduct research regarding disclosures related to energy and/or resource efficiency
Extractives & Minerals Processing	Oil & Gas - Exploration & Production	Technical	Transition to a Low Carbon, Resilient Economy	Consider the addition of a metric related to investments in and revenues derived from renewable energy technologies
Extractives & Minerals Processing	Oil & Gas - Exploration & Production	Technical	Transition to a Low Carbon, Resilient Economy	Consider the revision of the metric related to reserves sensitivity analysis considering IEA climate scenarios to consider alternative scenarios which align with the guidance of the TCFD
Extractives & Minerals Processing	Oil & Gas - Exploration & Production	Technical	Climate Regulation	Consider the revision of a metric related to GHG emissions to include methane emissions
Extractives & Minerals Processing	Oil & Gas - Midstream	Research	Transition to a Low Carbon, Resilient Economy	Conduct research to define a topic and/or metrics with disclosures related to scenarios which quantify the impacts of climate change on infrastructure utilization and company financial performance
Extractives & Minerals Processing	Oil & Gas - Refining & Marketing	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Extractives & Minerals Processing	Oil & Gas - Services	Research	Transition to a Low Carbon, Resilient Economy	Conduct research to define a topic and/or metrics with disclosures related to scenarios which quantify the impacts of climate change on demand for products and services with associated impacts to company financial performance
Extractives & Minerals Processing	Iron & Steel	Research	Transition to a Low Carbon, Resilient Economy	Conduct research to better quantify life cycle GHG and/or energy efficiency impacts of products
Extractives & Minerals Processing	Metals & Mining	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Extractives & Minerals Processing	Construction Materials	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Extractives & Minerals Processing	Construction Materials	Research	Transition to a Low Carbon, Resilient Economy	Conduct research to better quantify life cycle GHG and/or energy efficiency impacts of products
Transportation	Automobiles	Technical	Transition to a Low Carbon, Resilient Economy	Consider the addition of a metric describing company strategies to increase fuel economy and reduce fleet emissions
Transportation	Automobiles	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Transportation	Auto Parts	Technical	Transition to a Low Carbon, Resilient Economy	Consider the revision of a metric to improve the quality of the information generated by the standard related to revenue from products which increase fuel efficiency or reduce emissions

CONVERGING ON CLIMATE RISK: CDSB, THE SASB, AND THE TCFD

Sector	Industry	Agenda Type	Climate Risk	Summary of Actions
Transportation	Auto Parts	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Transportation	Car Rental & Leasing	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Transportation	Airlines	Research	Physical Effects	Conduct research regarding the potential materiality of physical climate effects, including both chronic and acute impacts, to the airlines industry
Transportation	Airlines	Research	Climate Regulation	Conduct research regarding the potential decision-usefulness and applicability of a disclosures related to the fuel efficiency and/or emissions associated with air travel
Transportation	Airlines	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Transportation	Air Freight & Logistics	Research	Physical Effects	Conduct research regarding the potential materiality of physical climate effects, including both chronic and acute impacts, to the airlines industry
Transportation	Air Freight & Logistics	Research	Climate Regulation	Conduct research regarding the potential decision-usefulness and applicability of disclosures related to the fuel efficiency and/or emissions associated with air travel
Transportation	Air Freight & Logistics	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Transportation	Cruise Lines	Research	Physical Effects	Conduct research regarding the potential materiality of acute physical climate effects, such as storm severity and frequency
Transportation	Marine Transportation	Research	Physical Effects	Conduct research regarding the potential materiality of acute physical climate effects, such as storm severity and frequency
Transportation	Marine Transportation	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Transportation	Rail Transportation	Research	Physical Effects	Conduct research regarding the potential materiality of acute physical climate effects, such as storm severity and frequency, flooding, or other risks with the potential to impact infrastructure integrity
Transportation	Rail Transportation	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Transportation	Road Transportation	Research	Physical Effects	Conduct research regarding the potential materiality of acute physical climate effects, such as storm severity and frequency, flooding, or other risks with the potential to interrupt business activity or damage assets
Transportation	Road Transportation	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Services	Leisure Facilities	Research	Transition to a Low Carbon, Resilient Economy	Conduct research to determine the potential materiality of water access to the industry
Resource Transformation	Chemicals	Technical	Transition to a Low Carbon, Resilient Economy	Consider revision of a metric to better represent industry management of risks related to energy production and consumption
Resource Transformation	Chemicals	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Resource Transformation	Aerospace & Defense	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Resource Transformation	Electrical & Electronic Equipment	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Resource Transformation	Industrial Machinery & Goods	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Resource Transformation	Containers & Packaging	Technical	Transition to a Low Carbon, Resilient Economy	Consider revision of a metric to better represent industry management of risks related to energy production and consumption
Resource Transformation	Containers & Packaging	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Food & Beverage	Agricultural Products	Technical	All	Extensive revision of the standard to better reflect industry-specific exposure to climate-related risks and opportunities
Food & Beverage	Meat, Poultry, & Dairy	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Food & Beverage	Processed Foods	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner

CONVERGING ON CLIMATE RISK: CDSB, THE SASB, AND THE TCFD

Sector	Industry	Agenda Type	Climate Risk	Summary of Actions
Food & Beverage	Non-Alcoholic Beverages	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Food & Beverage	Alcoholic Beverages	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Renewable Resources & Alternative Energy	Forestry Management	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Renewable Resources & Alternative Energy	Pulp & Paper Products	Technical	Transition to a Low Carbon, Resilient Economy	Consider revision of a metric to better represent industry management of risks related to energy production and consumption
Renewable Resources & Alternative Energy	Pulp & Paper Products	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Infrastructure	Electric Utilities & Power Generators	Research	Physical Effects	Conduct research to assess the potential materiality of assets to risks related to climate change, such as storm frequency and severity, flooding, and/or rising sea levels
Infrastructure	Electric Utilities & Power Generators	Technical	Transition to a Low Carbon, Resilient Economy	Consider addition of a metric related to rate structures to enhance the completeness of the set of disclosures related to end use efficiency
Infrastructure	Electric Utilities & Power Generators	Technical	Climate Regulation	Consider addition of a metric to capture GHG emissions associated with power deliveries
Infrastructure	Electric Utilities & Power Generators	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Infrastructure	Engineering & Construction Services	Research	Physical Effects	Conduct research to assess Structural Integrity & Safety risks presented to projects resulting from both acute and chronic physical risks associated with climate change
Infrastructure	Gas Utilities & Distributors	Technical	Transition to a Low Carbon, Resilient Economy	Consider addition of a metric related to rate structures to enhance the completeness of the set of disclosures related to end use efficiency
Infrastructure	Gas Utilities & Distributors	Technical	Transition to a Low Carbon, Resilient Economy	Consider revision of a metric to capture emissions associated with gas distribution network and infrastructure integrity
Infrastructure	Water Utilities & Services	Technical	Transition to a Low Carbon, Resilient Economy	Consider addition of a metric related to rate structures to enhance the completeness of the set of disclosures related to end use efficiency
Infrastructure	Home Builders	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Infrastructure	Real Estate Owners, Developers, & Investment Trusts	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner
Infrastructure	Real Estate Services	Research	All	Conduct research regarding use of scenario analysis to assess and report climate-related impacts in a cost-effective, decision-useful manner

Appendix IV: SASB Climate-Related Disclosures by Industry

Taken together, the quantitative greenhouse gas emissions metrics, other climate impact metrics, industry-specific metrics, and qualitative disclosures included in the SASB standards provide investors with a comprehensive view of corporate issuers' climate-related risks and opportunities.

As detailed in the SASB's *Climate Risk Technical Bulletin*,⁴² the SASB has identified the climate-related topics and metrics included in the SASB's industry-specific standards (example provided below). Because of the SASB's materiality focus, the standards provide corporate issuers with guidance on the small handful of climate-related metrics (four per industry, on average) that are likely to be decision-useful both internally for management and externally for investors. As is evident from the table, the SASB metrics are closely aligned with major climate-risk disclosure initiatives, including CDSB and CDP.

In the following table, as well as in the corresponding table within the *Climate Risk Technical Bulletin*, references to "alignment" may also indicate metrics from other organizations or regulations that have a high degree of overlap with the SASB metric, but are not necessarily directly linked or cited in the SASB standard. Issuers will be able to use some or most the information they have prepared for these other purposes in preparing disclosure in accordance with the SASB standard. Also, in these tables, source documents include select references that underlie the SASB metric, including other frameworks, standards, regulations and other resources. Issuers will find these reference points useful as they compile data and information.

⁴² Sustainability Accounting Standards Board, "Climate Risk Technical Bulletin" (October 2016), Table 3, pp. 18-84.

The following table contains information on impacts and alignment for the topics and metrics included in the SASB standard for the Iron & Steel Producers industry. The same information is available for 78 additional industries in the *Climate Risk Technical Bulletin*.

IRON & STEEL PRODUCERS (NON-RENEWABLE RESOURCES)

● Physical Effects
 ● Transition to a Low-Carbon, Resilient Economy
 ● Climate Regulation

Topic & Climate Risk	Metric	Category	Unit of Measure	Alignment/Source
Greenhouse Gas Emissions ●	Gross global Scope 1 emissions, percentage covered under a regulatory program	Quantitative	Metric tons CO ₂ -e, Percentage (%)	CDP Climate Change Information Request CC8.2 Emissions Data, CC8.5 Data Accuracy CDSB Framework REQ-04 Sources of environmental impacts Climate Change Reporting Framework 4.19.1, 4.29 GRI G4 Aspect: Emissions (EN15) Additional Source(s): WRI/WBCSD Greenhouse Gas Protocol (definitions and calculation methodology)
	Description of long-term and short-term strategy or plan to manage Scope 1 emissions, emissions reduction targets, and an analysis of performance against those targets	Discussion and Analysis	N/A	CDP Climate Change Information Request CC3. Targets and Initiatives CDSB Framework REQ-01 Management's environmental policies, strategy and targets, REQ-05 Performance and comparative analysis Climate Change Reporting Framework 4.12 GRI G4 Aspect: Emissions (EN19) SEC Guidance Regarding Disclosure on Climate Change
Water Management ●	Total fresh water withdrawn, percentage recycled, percentage in regions with High or Extremely High Baseline Water Stress	Quantitative	Cubic meters (m ³), Percentage (%)	CDP Water Information Request W1.2a, 1.2b, 1.2c CDSB Framework REQ-04 Sources of environmental impacts GRI G4 Aspect: Water (EN8, EN9, and EN10) WBCSD Global Water Tool (GWT) CEO Water Mandate – Section 3 Company Water Profile Additional Source(s): WRI Aqueduct (provides definitions of water stress); Alliance for Water Stewardship Standard Version 1.0
Energy Management ●	Total purchased electricity consumed, percentage renewable	Quantitative	Gigajoules (GJ), Percentage (%)	CDP Climate Change Information Request CC11.2, CC3.1d Climate Change Reporting Framework 4.31.f GRI G4 Aspect: Energy (EN3)
	Total fuel consumed, percentage from: (1) coal, (2) natural gas, (3) renewable sources	Quantitative	Gigajoules (GJ), Percentage (%)	CDP Climate Change Information Request CC11.3, CC3.1d GRI G4 Aspect: Energy (EN3)

Appendix V: Sample TCFD-, CDSB-, and SASB-Aligned Disclosures

The following example illustrates climate-risk disclosures made in accordance with the TCFD recommendations, the SASB standards, and the CDSB Framework, and incorporated into the Form 10-K for a fictional oil and gas exploration and production company, “Harris Robinson Energy, Inc.” In following the recommendations of the TCFD, the mock Form 10-K has incorporated relevant disclosure topics and metrics from the SASB Standard for Oil & Gas Exploration & Production into its Management’s Discussion and Analysis of Financial Condition and Results of Operations (MD&A). Further, it has also followed the principles and requirements of the CDSB Climate Change Reporting Framework.

This appendix serves as an example of one way companies might fulfill the TCFD recommendations; it is not intended to provide a template for companies to follow.

ITEM 7. MANAGEMENT’S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

Climate-related Risks & Opportunities

Overview

The Board of Directors has delegated to the Integrated Sustainability Review Committee (ISRC) matters relating to sustainable management of the Company’s activities. The Committee reviews internal compliance with sustainability codes and principles across all business units, supervises compliance regarding environmental, health, and safety matters, conducts scenario planning for impacts related to environmental and social trends and uncertainties, and assists the Board of Directors in determining material sustainability issues for disclosure herein.

As such, the ISRC has responsibility for assessing and managing climate-related impacts to the Company. As part of this process, the Company conducted an assessment to determine climate-related risks and opportunities it faces; the assessment is based on the Recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD) and relevant sections of the Sustainability Accounting Standards Board’s (SASB) Sustainability Accounting Standard – Oil & Gas Exploration & Production (NR0101).

The following section includes climate disclosures recommended by the TCFD for all sectors, those specifically recommended by the TCFD for the energy sector, and metrics from the SASB NR0101 Standard.

Governance

As described previously, the ISRC has oversight of climate-related risks as part of its overall responsibility of sustainability strategy and policy, risk identification and management, and environmental and social compliance.

Members of the ISRC meet with the directors of operations of each business unit on a quarterly basis to discuss all relevant sustainability issues, including those related to the climate. Before each board meeting, the ISRC meets to assess and prioritize these issues before presenting its findings to the full board. The board also provides direction, through the ISRC, to the directors of operations of each business unit on which sustainability and climate issues are likely to present potentially material risks and/or opportunities.

Given the evolving social and regulatory conditions related to the climate, the board incorporates climate-related issues into most strategic decisions, particularly those related to risk management, infrastructure, research and development, resource efficiency programs, acquisitions and divestitures, and regulatory compliance.

Responsibility for monitoring progress against goals and targets falls on the ISRC members and the directors of operations of each business unit. The ISRC updates the board quarterly, and the board provides feedback and direction, just as it does with other ISRC-related matters. Managers across most functions within each business unit are responsible for monitoring performance and reporting to the directors of operations. Managers, directors, ISRC members, and board members are also all responsible for monitoring external sources of information regarding potential climate-related trends, risks, and potential uncertainties. Employees and board members are expected to manage climate-related risks and opportunities at a satisfactory level of performance as part of their ongoing duties. Although no specific performance incentives are provided related to these responsibilities, sub-par performance could adversely affect a person's position with the Company.

In 2012, Company management engaged an external climate-risk consulting firm to assess the validity of internal projections and improve external information-gathering processes. In 2014, management engaged the firm again for another review. In both instances, we incorporated most of the firm's recommendations and continue to follow them today.

Strategy

Short-, medium-, and long-term risks and opportunities

The Company attempts to consider all relevant risks and opportunities, including those related to the climate, in strategic decisions. With respect to the climate, we consider the short term to be roughly within the next two years, the medium term to be roughly between two and ten years from now, and the long term to be more than ten years in the future. However, when assessing risks and opportunities, which by nature are uncertain, we take a holistic approach and do not always strictly categorize risks and opportunities into these terms.

We use the Securities and Exchange Commission's two-part disclosure assessment to determine whether a climate-related risk or opportunity could have a material financial impact on the Company. We also use SASB's five-factor test, which SASB employs to develop standards, to assess risks and opportunities for materiality. The SASB standards cover the minimum set of disclosure topics likely to be material to a specific industry. They do not cover every possible risk or opportunity, so we use the five-factor test when assessing issues not covered by SASB standards. Short-, medium-, and long-term transition and physical climate-related risks include:

Short-term transition risks:

- **Regulations:** Complying with existing climate regulations may increase operating costs in ways not already accounted for in our financial plans.
- **Demand:** Consumption of oil and gas may fall faster than already anticipated in our financial plans.

Medium-term transition risks:

- **Regulations:** Regulations may become more stringent. In some instances, regulations may differ substantially from one geographical region to another, creating potential additional compliance costs.
- **Demand:** Industry disruptions, such as storage technology advances, could substantially reduce demand for oil and gas.

Medium-term physical risks:

- Infrastructure: Increasingly severe weather could damage equipment, increasing operating costs. Retrofitting equipment could require additional investments.

Long-term transition risks:

- Regulations: Regulations related to building resilient infrastructure could increase substantially, which could make some infrastructure projects infeasible and some reserves unprofitable to extract.
- Demand: Same as medium-term transition risks.

Long-term physical risks:

- Infrastructure: In addition to the medium-term risks listed above, unexpected effects of climate change could make some reserves unprofitable to extract.

In the immediate term, we are responding to climate-related issues by working to monitor our direct (Scope 1) greenhouse gas emissions and our management of water resources, as described in the sections titled "Strategy to manage Scope 1 emissions" and "Water Management." For the longer term, we are pursuing lower-carbon fuel sources, both by increasing our focus on natural gas and by exploring alternative energy as the basis for additional technologies, products, and services that may be more viable as we transition to a carbon-constrained economy.

Climate-related issues are one of many factors we use to make financial plans and projections; we prioritize factors based on their immediate and long-term likelihood to impact our financial condition and competitive position.

Scenario analysis of different impacts

At present, it is not entirely clear how the climate will change in the future or what the response from regulatory agencies and customers will be. Despite this uncertainty, the pathways by which climate change will affect the Company are clear: operating cost, capital expenditure, and price and demand changes. In the "Reserves Valuation & Capital Expenditures" section of this MD&A, we discuss how the Company considers potential price and demand changes in the context of its strategy. We reproduce that section here. In it, we model two scenarios: (1) the "Current (base)" scenario, which assumes no changes to policies currently in place as of the midpoint of 2016, and the (2) the "450 Scenario," which, to avoid an increase in global temperature beyond 2°C, limits concentration of greenhouse gases in the atmosphere to around 450 parts per million of CO₂.

The Company's ability to profitably extract all its reserves depends, to a degree, on extraction costs and the price of crude oil and other hydrocarbons. The Company makes continual efforts to improve the efficiency of our exploration and production costs in order to reduce the impact prices have on our operations. Still, a substantial fall in the price of oil and/or gas could make some extraction financially infeasible.

Separately, the company currently estimates and discloses its reserves as required by Item 1202(a) of Regulation S-K. This method makes use of historical prices of oil and gas. Here, the Company has conducted a sensitivity analysis of its proved and probable reserves based on price scenarios outlined by the International Energy Agency in its World Energy Outlook publication.

Under prices outlined in the "450 Scenario," the Company may see a reduction in the size of its proved and probable reserves. The scenario projects that prices will deviate significantly from the Current Policies baseline after the year 2020. Previously, the Company had projected this scenario to be highly unlikely to occur. However, after the signing of the Paris Agreement, management revised its assumptions and now

expects this scenario to be reasonably likely to occur. Still, given continuing demand for hydrocarbons, the mix and type of our hydrocarbon reserves, and our broadening focus to include lower-carbon energy sources, we believe the Company remains well positioned for continued demand for our products.

Sensitivity of reserve levels to future scenarios in which a price is charged on carbon emissions

Based on reasonable estimates of the type of the Company's hydrocarbon reserves, we have determined the likely carbon dioxide emissions that would be associated with their combustion. The company maintains no reserves of coal and minimal reserves of unconventional hydrocarbons like tar sands that typically have a higher carbon content than traditional deposits. Therefore, on a CO₂-per-barrel basis, the estimated emissions in our reserves ranks below the industry average (0.11 t CO₂ / BOE as compared to an industry average of 0.18 t CO₂ / BOE). Should the Company acquire and develop more carbon-intensive reserves in the future, there is a risk that it may not be economically feasible to extract them. This risk is due to uncertainty around future climate change regulation and the potential effects on hydrocarbon prices.

The table below shows the company's estimates of its Proved and Probable reserves based on the results of its scenario analysis analyzing the Current Policies and 450 Scenarios, per the International Energy Administration's World Energy Outlook:

Price Case	Proved Reserves		Probable Reserves	
	Oil MMbbls	Gas MMscf	Oil MMbbls	Gas MMscf
Scenario				
Current (base)	435	5,828	757	7,200
450 Scenario	378	4,800	701	6,430

Impact of price and demand for hydrocarbons and carbon regulations on capital expenditure strategy for exploration, acquisition, and development

Our operations require large capital investments, and the decision to make such investments depends heavily on our ability to recoup them. If the price of or demand for hydrocarbons fall substantially, we may find it financially infeasible to pursue extraction in some areas.

Many factors affect prices for oil and gas, including macroeconomic conditions, currency values, and the ability of some industry entities to influence prices. As a result, prices are extremely difficult to predict accurately. However, the Company does make projections to facilitate decision-making. The Company's current projections account for a wide variety of price scenarios; some of these scenarios factor in prices affecting hydrocarbons, which could be in the form of carbon taxes or cap-and-trade systems. These projections inform the Company's risk management and business planning processes and will enable it to adjust its asset allocation strategy.

The Company also invests in projects and technologies to manage climate risk and capture opportunities, including flare reduction, carbon capture and sequestration, biofuels, and renewable power generation including wind and solar. The Company's strategic and business planning considers the value of these projects in the context of its overall approach to climate change risk management.

Although the Company prepares for many scenarios, it believes that extreme reductions in demand for or prices of hydrocarbons are unlikely in the short term. Some of the countries in which we operate have yet to adopt carbon pricing regulations or systems. Although many countries are likely to institute at least some form of carbon-related regulation or pricing in the future, the Company believes that it will be able to recoup a material share of its capital expenditures related to extraction before such pricing systems are fully implemented. Ultimately, the Company consistently monitors the potential for carbon regulation

implementation and engages in scenario planning on a regular basis to better inform its operating—and capital expenditure—decisions.

Some operations, especially hydraulic fracturing, can be expensive and require substantial capital investments. Our 2013 acquisitions, which increased the amount of these operations under our control, have required a limited amount of capital expenditures. When bidding on the companies, we did account for these costs, and they did not substantially exceed our estimates.

PHYSICAL RISK ANALYSIS

The physical risks identified in the preceding “Strategy” section may be less likely to manifest under the “450 Scenario” than under other scenarios, but as noted, it is impossible to accurately or precisely predict the effects of climate change. To the extent that these risks materialize and we are unprepared for them, we may incur unexpected costs, which could have a material effect on our financial results of operations. We also face financial risk if we prepare for physical impacts that ultimately do not occur. We are currently assessing the costs and benefits of our preparation options to determine the best course of action. At the same time, we are implementing some precautionary measures to certain parts of our infrastructure based on the likelihood that severe weather incidents will increase.

Risk Management

We identify and assess climate-related risks as part of our overall sustainability strategy, which is led by the ISRC. The ISRC works with the board, business unit directors, and managers to integrate climate-related risks into our Company-wide risk-management processes. Underlying that process is the understanding that many climate-related impacts are likely to manifest in the long term.

When comparing climate-related risks to other risks in order to set priorities, we look at two primary factors: regulatory compliance and Company financial results. When comparing climate-related risks to each other, we assess the potential magnitude on these two factors. Several sub-factors affect financial results, including demand for our products, market prices for hydrocarbons, and operating costs, all of which can also relate to regulations. More information about how we consider regulations related to climate change is available elsewhere in this MD&A, particularly in the “Greenhouse Gas Emissions,” “Water Management,” “Community Relations,” and “Reserves Valuation & Capital Expenditures” sections.

We employ several measures to mitigate, transfer, control, or accept climate-related risks. These include purchasing insurance, monitoring potential regulatory changes and attempting—when legal and ethical—to influence those changes, following industry best practices, and engaging external experts. We also engage in the scenario planning described earlier. For information about how we make risk-related materiality determinations, please see the “Strategy” section on the previous page.

Metrics and Targets

In measuring and managing climate-related risks and opportunities, we use the metrics and targets described earlier in this MD&A. Earlier sections also discuss specific targets and our progress towards them. Three sets of metrics are most relevant to climate-related risks and opportunities: Greenhouse Gas Emissions, Water Management, and Reserves Valuation & Capital Expenditures.

GREENHOUSE GAS EMISSIONS: GROSS GLOBAL SCOPE 1 EMISSIONS

As part of an Energy Efficiency Initiative (EEl) implemented Company-wide on January 1, 2014, the Company plans to reduce gross global scope 1 emissions by 2 percent from 2013 levels by 2018, as calculated on an absolute scale. At the time of this filing, we are on track to meet that goal.

For additional data related to climate risk, including our Scope 2 and Scope 3 greenhouse gas emissions, please see our CDP Questionnaire.

Metric	Year Ended December 31,		
	2014	2015	2016
Gross global Scope 1 emissions (in thousands of metric tons CO ₂ -e)	7,762	7,690	7,640
Percentage from			
Conventional oil operations	45%	42%	42%
Unconventional oil operations	11%	9%	9%
Conventional gas operations	31%	37%	37%
Unconventional gas operations	13%	10%	10%
Percentage covered under a regulatory program	3%	3%	5%

GREENHOUSE GAS EMISSIONS: GROSS GLOBAL SCOPE 1 EMISSIONS BY OPERATIONAL SOURCE

These emissions are a normal byproduct of necessary operational practices, such as gas compression or well testing. We attempt to minimize fugitive emissions/leaks, largely because they represent operational inefficiencies and could present safety risks to employees.

Metric	Year Ended December 31,		
	2014	2015	2016
Gross global Scope 1 emissions from (in thousands of metric tons CO ₂ -e)			
Combustion	6,598	6,592	6,555
Flared hydrocarbons	388	380	378
Process emissions	543	540	542
Directly vented releases	388	384	384
Fugitive emissions/leaks	237	241	236

WATER MANAGEMENT: FRESH WATER USAGE, RECYCLING, AND USAGE IN WATER-STRESSED AREAS

The Company uses water in many of its exploration and production activities and attempts to reduce waste and recycle water whenever possible. We also acknowledge that water is increasingly being recognized as a precious resource and may cost more in the future than it does today. To mitigate this risk, we invested \$4 million in 2013 to research methods to both decrease our water usage and increase our water recycling rates. We continuously review potential methods to increase the efficiency of our water use in order to operate effectively.

For additional water-management related metrics, please see the Water Management section of this MD&A.

Metric	Year Ended December 31,		
	2014	2015	2016
Total fresh water withdrawn (in thousands of cubic meters)	2,050	2,167	2,240
Percentage recycled	14%	17%	19%
Percentage in regions with high/extremely high baseline water stress	6%	9%	9%

RESERVES VALUATION & CAPITAL EXPENDITURES: ESTIMATED CO₂ EMISSIONS EMBEDDED IN PROVED HYDROCARBON RESERVES

Metric	Year Ended December 31,		
	2014	2015	2016
Estimated CO ₂ emissions embedded in proved oil reserves (billions of kg of CO ₂)	834	880	904
Estimated CO ₂ emissions embedded in proved gas reserves (billions of kg of CO ₂)	147	194	206

ABOUT CDSB

The Climate Disclosure Standards Board (CDSB) is an international consortium of nine business and environmental NGOs committed to advancing and aligning the global mainstream corporate reporting model to equate natural capital with financial capital. It does so by offering companies a framework for reporting environmental information with the same rigor as financial information. In turn, this helps them to provide investors with decision-useful environmental information via the mainstream corporate report, enhancing the efficient allocation of capital. Regulators also benefit from compliance-ready materials. Collectively, we aim to contribute to more sustainable economic, social, and environmental systems.

ABOUT SASB

Established in 2011, the Sustainability Accounting Standards Board (SASB) is an independent standards-setting organization dedicated to enhancing the efficiency of the capital markets by fostering high-quality disclosure of material sustainability information that meets investor needs. The SASB develops and maintains sustainability accounting standards—for 79 industries⁴³ in 11 sectors—that help public corporations disclose material information to investors in annual SEC filings. SASB's rigorous process, that includes evidence-based research and broad, balanced stakeholder participation, yields standards that are valued by investors and corporations alike because they are cost-effective and decision-useful. The SASB standards board comprises nine members with diverse backgrounds and expertise encompassing capital markets regulation and policy; investing; financial accounting; securities law; corporate finance; and sustainability. For more information, visit www.sasb.org and follow us [@SASB](https://twitter.com/SASB).

⁴³ Where traditional industry classification systems group companies by sources of revenue, the SASB's approach considers the resource intensity of firms, and groups industries with like sustainability characteristics, including risks and opportunities, within SASB's Sustainable Industry Classification System™ (SICS™) found at: <https://www.sasb.org/sics/>. SASB has proposed a number of amendments to SICS, and the revised classification system will go into effect when the standards are codified in early 2018. Proposed changes to SICS are on SASB's website and the TA items proposed herein are based on the new classification.



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