

Full Report

State of the Practice: Sustainability Standards for Infrastructure Investors

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Authors' Note

The metric systems and tools that investors use to measure sustainability in the infrastructure sector are constantly evolving, and for good reason. This study was completed based on the metrics and tools included at the time of this writing. Many are currently undergoing revisions, launching new products or metrics, or adjusting their methodology. Despite the industry's continuing evolution, we hope that readers find this study to be a useful "snapshot" of the state of the practice as it stands today.

The authors would like to thank the members of the World Wildlife Fund, the Natural Capital Project, and Guggenheim Partners for their invaluable feedback and guidance in completing this study. The authors would also like to thank the members of World Bank, and the Inter-American Development Bank for their comments and feedback on the study. Finally, we would like to thank the developers of the sustainability metrics and tools included in this study, and the members of the infrastructure investment and development community that contributed their time and input to this study for their feedback and perspectives.

Foreword by Scott Minerd



Infrastructure in the developed world is decaying, while much of the developing world is eager to build out its energy, transportation, communications, and housing infrastructure to drive economic growth. Addressing this need for investment requires a serious and concerted effort to establish standards that will guide the development of infrastructure to benefit everyone. Technological innovation, economic necessity, and environmental considerations all must be part of this conversation. At the same time, infrastructure is fast becoming an important asset class to the investment community, which is increasing its focus on environmental, social, and governance (ESG) criteria when making investment decisions.

With this as backdrop, WWF and Guggenheim Partners commissioned members of the Stanford Global Projects Center to identify and analyze the various metrics that have been established by multiple organizations to assess the sustainability of infrastructure investments. Such evaluations are not new, but there has been a recent proliferation of these metrics, each with its unique purposes and criteria. As measuring sustainability garners greater attention, understanding the range and application of these metrics will allow investors, companies, governments, and citizens to pursue infrastructure investments that can lead to economic growth that is balanced against the moral and ethical considerations shared by all stakeholders.

At its core, sustainable development means investing in safe and reliable infrastructure to power our world, feed our people, and foster growth in ways that preserve and protect our environment. It is becoming clear that before infrastructure investing can successfully transition to an institutional asset class, there must be consistent methodologies for determining its sustainability. The fruits of this project will make a significant contribution toward achieving that objective. I want to thank Carter Roberts and his team at WWF for partnering with us on this project, and look forward to our organizations continuing to work together to foster dialogue on the development, construction, and financing of sustainable infrastructure.

A handwritten signature in black ink, appearing to read 'Scott Minerd', written in a cursive style.

Scott Minerd

Chairman of Investments and Global Chief Investment Officer
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Foreword by the Authors

Sustainability and resilience are critical factors in the field of infrastructure development. Assessing and promoting the sustainability of infrastructure projects is not only the concern of governments and the development institutions that they support, but the responsibility of every member of the infrastructure value chain. As the infrastructure asset class has matured over the last decade, infrastructure investors have developed tools and methodologies to better measure the sustainability of their investments, and these are a critical step in making sustainability a priority throughout the development process – what can be measured can be managed. Despite the increasing recognition of sustainability as a critical factor in infrastructure development, measuring sustainability remains a difficult challenge for the industry.

The infrastructure community is stepping up to this challenge. The enclosed desk study represents our initial efforts in conducting research on the metrics and methodologies behind measuring sustainability in the infrastructure industry. It includes a detailed review of some of the most prominent tools and accounting systems for measuring sustainability as they exist today. We assessed the environmental, social and governance criteria that they include, the specific practices or performance indicators that they use to measure them, and the methodology they use to measure or report on those criteria. As the industry continues to evolve, we hope this will serve as a useful review of the many tools available to infrastructure investors to better report on the sustainability of their portfolios. It has certainly been useful to us in identifying topics for future research related to this field.

We would like to thank the World Wildlife Fund, the Natural Capital Project and Guggenheim Partners for their invaluable feedback and guidance in completing this desk study. We would also like to thank the many members of the development community, infrastructure investors, and metric developers that provided feedback and input during the completion of this study. We look forward to continuing to partner with members of the infrastructure community to develop additional research on the sustainability of infrastructure investments and to promoting sustainable development in the future.



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Part 1: Introduction and Literature Review

1a. Introduction

By 2050, the world's population is forecasted to reach 10 billion people, and consumption of natural resources is expected to increase four-fold above current rates. The United Nations Environment Program (UNEP) has estimated that Earth's capacity is at or beneath 8.5 billion people. It is apparent that our ecosystems and environment are under threat from the process of economic growth and various human activity.

Developing and maintaining infrastructure systems that are sustainable is a central part of mitigating the environmental impacts of development. In the broadest sense, infrastructure services are those physical facilities that provide the building blocks of a functioning society. Economic infrastructure relates to the channels, pipes, conduits and apparatus that deliver power and water, provide protection from floods and take away waste. It also includes the roads, railways, airports and harbors that allow the safe movement of people and goods between communities. These services directly support the wellbeing of households as well as production activities of enterprises at various points of the value chain, and is thus directly relevant to the competitiveness of firms and to economic development. How these systems can be maintained and continued without incurring significant harm to the environment is of great importance.

This study aims to review the standards and assessment tools available to investors and developers to measure or report on the sustainability and resilience of their infrastructure investments. This report provides a summary of the most commonly used procedures and best-practices adopted by institutional investors in the infrastructure sector to date. It includes detailed reviews of currently developed sustainability standards and assessment tools as well as a general review of sustainability practices by infrastructure investors and other members of the infrastructure development value chain.

While they share a higher-order goal of a more sustainable planet, the methods and tools used by private investors to measure and report on sustainability are naturally very different than the methods used by governments to assess the environmental impacts of projects. This report is focused on the former, and differentiates between sustainability standards that are used by infrastructure investors and developers, which we describe as more conservationist, with the standards of environmental assessments used by governments, which we describe as more preservationist. Preservationist standards are generally more focused on whether a project should move forward with construction. Conservationist standards or assessments are generally more focused on implementing a project that will be developed in the most sustainable way possible. By framing the assessment of investor sustainability metrics in the context of environmental assessments by governments, this study aims to highlight how the more conservationist investor metrics can support earlier stage assessments by governments to ensure infrastructure projects are developed and maintained with sustainability as a focus throughout the project lifecycle.

Significant progress has been made in recent years to develop tools and assessments that can help infrastructure investors measure and report on the sustainability of their projects. This study provides a detailed review of many of these tools and how they are actually applied in practice today.

1b. Purpose of this Study

The aim of this study is to take stock of the current state of sustainability measurement and standards in the infrastructure investment and development industry, and to review the current set of tools available to infrastructure investors and other participants in the infrastructure value chain to measure environmental, social and governance performance indicators and practices. The core of this study is a comparative assessment of more than a dozen standards and tools currently available to the industry. The assessment is based on a five dimensional framework of each standard's comprehensiveness, objectivity, clarity, transaction costs and traction. This review is supplemented with a set of interviews with institutional investors, asset managers, service providers, environmental advocates, engineering and construction firms, and public sector sponsors in the infrastructure sector to assess the current state of the practice and identify challenges.

This body of research is used to develop general conclusions as to the current progress of the sustainability measurement industry in the infrastructure sector, challenges to further progress and the wider adoption of sustainability standards, and areas for future research. This study also includes a brief comparison of environmental assessment and sustainability measurement in the infrastructure investment industry with similar programs and regulations used by governments to assess the environmental costs and benefits of infrastructure projects.

This section includes a review of current academic literature on sustainability assessment in the infrastructure investment industry. Part 2 includes a review of sustainability measurement programs used by infrastructure investors and other members of the value chain as well as a detailed assessment of each standard included in this study. Part 3 includes a discussion of conclusions from this research and from the interviews conducted to complete this study. Part 4 reviews our recommendations, identified challenges to further progress and areas for future research.

1c. Literature Review

The methodology behind the environmental review and assessment of major infrastructure projects has been widely studied in academic and industry literature, though the vast majority of these studies have focused on the public sector review process for new projects. The literature on investor metrics or certifications on sustainability and other environmental factors is relatively smaller and more recent. Many studies have further been completed that focus on sustainability practices and metrics for a particular subsector of infrastructure development, though more recently research on the cross-sectoral assessment of sustainability by investors has also been developed. This desk study is focused on the evaluation of cross-sectoral evaluation or reporting tools for private infrastructure investors.

Early definitional research on the concept of sustainable infrastructure development, and its rough definition of advancing economic development while simultaneously protecting the environment and quality of life for future generations, date back to the late 1980's through the late 1990's, as more robust frameworks were proposed in literature (WCED, 1987) (Foxon, et al., 1999). Some of this early research focused on methodological issues, such as the need for any sustainability metrics to remain dynamic to adjust to changing environmental indicators or the desires of future generations (Loucks, et al., 2000), or issues in interpreting environmental performance indicators in the context of particular projects (Levett, 1998). Later studies focused on the development of computational models to assist with sustainability decision making via the aggregation of indicators and management practice criteria relating to environmental, social, and governance performance in developed and developing economy projects, including recommendations for the development of decision support and evaluation tools like those included in this study (Sahely, et al., 2005) (Ugwu & Haupt, 2007).

More recent literature has assessed some of the investor or project evaluation tools and ratings included in this study or proposed additional, specific metrics. Early studies compared performance indicators and other metrics in real estate or building projects with early versions of infrastructure evaluation tools to identify points of comparison and highlight issues (Siew, et al., 2013). Several of the issues raised by these studies will be revisited for current generation assessment tools herein, such as the importance of project context in ensuring metrics are within a project's scope (Chew & Das, 2007), concerns over whether metric systems have the potential to induce point-hunting (Fenner & Ryce, 2008) or the need to more clearly publish the reasoning behind criteria selection or the weighting of criteria (Berardi, 2012). Other studies have focused on more sector-specific tools for project assessment in transportation or water infrastructure, and their relative merits and points of overlap. (Brodie, et al., 2013) compare transportation-focused and neighborhood-focused sustainability measurement tools to compare what criteria are included in each sector, and identified a relative lack of social sustainability criteria in some of the transportation-focused tools. (Bocchini, et al., 2014) review project sustainability screening or rating tools for buildings and some early infrastructure tools and commonly-used metrics for resilience and argue that resilience and sustainability assessments should be integrated in assessment tools.

Other literature has focused on holistic metrics for city sustainability or sustainable urban development. (Lynch, et al., 2011) reviewed 22 different systems of measuring urban development used by cities, non-profits, and companies to derive 145 standard indicators across the different metric system. The study further concluded that social and economic sustainability were underemphasized in the systems studied and that the separation of assessment systems along environmental, economic and social sustainability prevented systems from capturing broad movements in sustainability. (Hiremath, et al., 2013) review existing urban indicators and propose a process through which individual cities can develop benchmarks and select from indicators most relevant to their local context in assessing sustainability. (Clark & Mangieri, 2017) propose a model of Sustainable Return on Investment (SROI) based on some of the metrics included in Envision which quantifies, in dollar terms, a subset of the hard metrics included in Envision such as fuel use or emissions avoidance to produce a single value of sustainability. (Sierra, et al., 2017) propose a mathematical model for quantifying social sustainability in infrastructure project selection in developing economies, which they argue is under-emphasized in many sustainability assessments.

Most recently, research studies have reviewed investor sustainability metrics and some of the cross-sectoral assessment tools included in this study, and proposed adjustments, new metrics or new methodologies for assessments. (Sheesley, et al., 2014) apply Envision to a particular case study in a port improvement project to denote the benefits and design changes that resulted from the use of the sustainability rating system. (Minsker, et al., 2015) review the progress of sustainable infrastructure tool and metric development, including Envision, and propose the increased use of environmental performance indicators, as opposed to management practices or checklists, in project evaluation tools combined with value-based optimization for decision making, amongst other recommendations. (Diaz-Sarachaga, et al., 2016) review in detail Envision, CEEQUAL and IS to assess their applicability in developing economies, and concluded that those assessment tools were weighted towards environmental factors as opposed to economic or social factors, which are a greater concern for developing economies. The study also proposed the development of sustainability assessment tools with metrics more tailored to developing economies. (Gupta, et al., 2016) review Envision, CEEQUAL and IS as well as two sustainability rating systems focused on the road sector (Greenroads and INVEST) and recommend the addition of metrics that would measure the financial sustainability of project in these rating systems, in addition to the metrics focused on environmental or social sustainability.

Finally, global development banks and other multilateral lending institutions have produced a large body of research developing sustainability metrics and criteria and more recently have produced studies which compare their internal frameworks with the accounting tools or rating systems included in this study. Other studies have attempted to compare the financial returns of investment funds with a sustainability or impact investment-focus with general industry benchmarks (Cambridge Associates, 2017). The Inter-American Development Bank (IDB) has developed an internal framework for measuring and promoting sustainability throughout the life-cycle of its projects (Inter-American Development Bank, 2018), and has further studied the overlap between their sustainability framework and many of the investor tools included in this study and the sustainability criteria in other development institutions (Serebrisky, et al., 2018). That study identified some differences, in terms of the criteria included in the assessment tools, at different stages of the project life-cycle. Among other findings that study identified that few of the sustainability frameworks included criteria for the very early project planning phases of a project, and that financial or economic sustainability criteria were not included in many of the assessment tools or sustainability frameworks included in the study.

This study contributes to this growing area of research by evaluating the current set of investor assessment tools available in the hopes of identifying areas for further study and promoting more effective infrastructure sustainability standards.

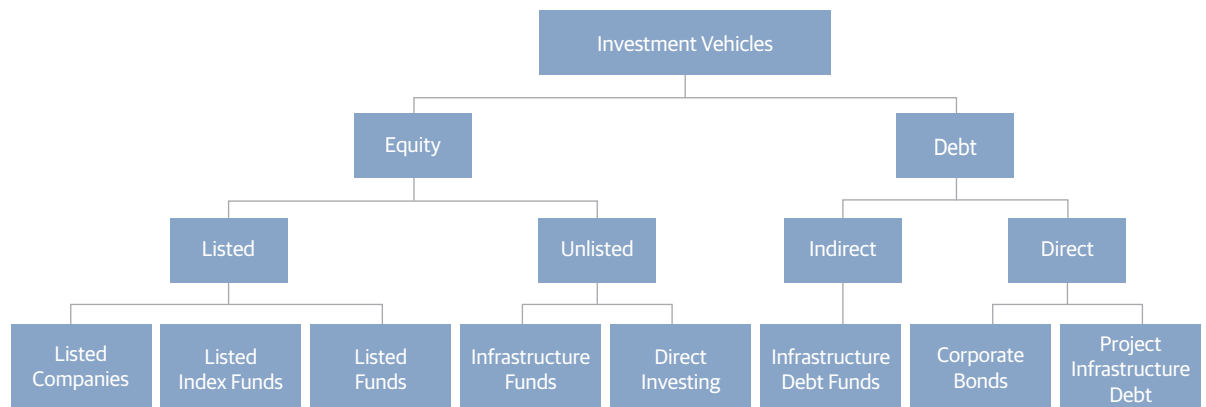
Part 2: Institutional Investor Standards

2a. Institutional Investment in Infrastructure - Overview and Trends

Over the last three decades, through the processes of privatization, liberalization and globalization, institutional investors have started to invest in infrastructure assets around the world. The global infrastructure investment market has centered around regions where governments have been able to offer investable assets and a stable legal and regulatory framework under which the investments are made.

As is the case for other asset classes, there are a number of different vehicles on offer for private investment in infrastructure. Both debt and equity vehicles have been used by investors to access economic infrastructure. The infrastructure asset class is heterogeneous and not all investments embody the same risk/return characteristics. The vehicle selected for investment will therefore depend both on the nature of the asset and on how the investors have defined and allocated infrastructure in their portfolios. The various investment vehicles for infrastructure are summarized in Figure 1 below:

Figure 1: Infrastructure Investment Vehicles



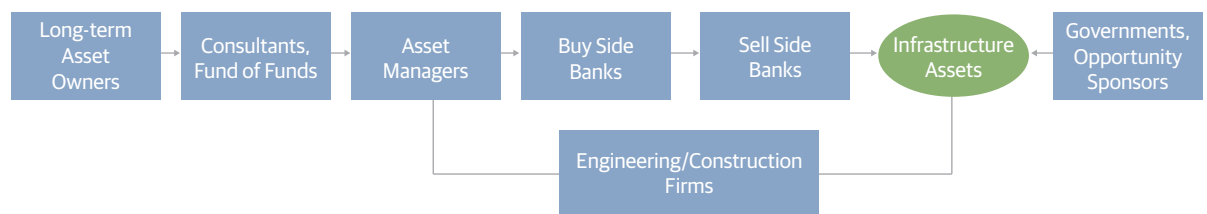
Infrastructure investments can be accessed through the public markets through stocks and bonds as well as through the private markets through unlisted funds or through direct investments in equity and debt. The standards used for sustainability measurement will vary depending on how the infrastructure investment is accessed. Infrastructure assets commonly share some of key characteristics that have made the asset class attractive to investors. Typically infrastructure assets are long-term assets that have risk and return profiles that suit the long-term liability structures of asset owner investors such as pension funds and sovereign wealth funds. The asset owner investors will invest into infrastructure assets either directly or indirectly through asset managers. The long-term nature of infrastructure investments can accentuate the sustainability and resilience-related risks particularly in the unlisted equity market where these risks can play a significant role. In certain circumstances, asset managers play the leading role in establishing and adopting sustainability standards into the infrastructure investment process. In other situations, it is the asset owner investors that instigate the action on sustainability for infrastructure investments.

The issue of who and how sustainability is incorporated into the infrastructure investment process is also related to the inherent principal agency issue between asset owners and asset managers. While asset owners are long-term investors, asset managers may be more short-term oriented because of their incentive structure. This is particularly relevant for the unlisted infrastructure equity market where a number of infrastructure funds have adopted the private equity incentive structure that usually only allows for an investment holding period of 4-5 years in order to make the most of the financial rewards of this vehicle. With such a structure, asset managers may not be incentivized to incorporate sustainability standards into their investment process.

2b. Overview of the Infrastructure Value Chain and Sustainability Standards

While much of the description above is related to the investor side of the infrastructure investment process, the infrastructure investment value chain extends to those entities procuring the assets. There are a number of institutions involved in sustainability measurement throughout the value chain as depicted in Figure 2 below:

Figure 2: Infrastructure Investment Value Chain



The process of deploying investment capita into the infrastructure assets that require investment can be lengthy and complex given the number of entities involved. An understanding of the process provides context for how sustainability standards are developed and utilized by these various players. As described above, on the investor side, sustainability standards may be incorporated by asset owners such as pension funds, sovereign funds, family offices and endowments, or they may be instigated by asset managers or consultants that asset owners have employed.

The majority of infrastructure assets that the investors highlighted above have invested into have been brownfield assets i.e. existing assets that are already operational and have low capex requirements. Greenfield or primary projects are assets that are being constructed for the first time at a specific site and could be in the planning, development or construction stage. While engineering firms have more recently partnered with institutional investors in brownfield investments, the incorporation of sustainability standards through engineering and construction firms is more apparent in Greenfield projects. Similarly, the environmental and regulatory policies of government agencies are especially important in greenfield projects or in the reconstruction, renovation or expansion of existing assets. As such, while the main focus of this report centers on the standards adopted by institutional investors, an understanding and appreciation of the standards adopted by engineering firms and those developed by government agencies is also briefly touched upon.

2c. Common Practices for Measuring Sustainability in Infrastructure Portfolios

The most common ways that environmental sustainability standards have been incorporated into the investment decision-making process of institutional investors has been through the adoption of Environmental Social Governance (ESG) or Responsible Investment programs. ESG refers to the three central factors for measuring the sustainability and ethical impact of an investment in a company or business. Responsible investment frameworks have been adopted following the formation of the United Nations' Principles for Responsible Investment, the leading global network of investors to demonstrate their commitment to responsible investment and the incorporation of ESG into the investment process. There are currently over 2000 organizations spanning asset owners, investment managers, and other financial service providers that have signed up to the United Nations Principles for Responsible Investment.

It has now become popular practice for investors to monitor their portfolios with regards to their ESG impact. A number of research providers analyze the assets held in investor portfolios against best practice standards as defined by the UN PRI and Global Compact. The incorporation of ESG into investment portfolios has evolved over time. Initially, investors with an ESG focus simply excluded certain assets from their portfolio that did not align with their principles on the issues. Over time, the exclusionary mindset has shifted to more of an integration one, where ESG has become a factor for whether an investment is attractive or not. This is particularly relevant in public markets where exclusionary screening can impact the returns of the portfolio. Furthermore, an investor cannot make a difference or have an impact on that company because they are not an investor. Integration has not necessarily been about being an activist investor. Instead, it has been about applying sustainability data or ratings to understand how companies are performing and how they can improve.

There is a mindset amongst certain investors that ESG manifests itself over a long time horizon, and so investors are using ESG metrics to inform them on how these factors will impact them. Data on ESG can be obtained from rating agencies or from other sources, as highlighted in this report or certain investors and asset managers are using raw data to build their own ESG evaluation. The metrics specific to ESG include factors that are applicable to any company in any industry, as well as specific factors for each industry such as infrastructure. As highlighted above, these factors are particularly relevant for infrastructure because of the long-term nature of investments in this sector.

Amongst the asset owner community, the adoption of sustainability into investment decision making is usually related to the governance capability (and thus size) of the investor. The more sophisticated the governance of an asset owner investor, the more likely the investor will incorporate ESG and sustainability into their processes. At the more sophisticated end of the spectrum, this has meant setting up a dedicated ESG or Responsible Investment team with the specific task of integrating sustainability into the investment process. This has involved integrating RI and ESG analysis into the prioritization of investment opportunities, integrating RI and ESG assessment into due diligence and investment approvals, reviewing and monitoring assets and managers for their RI or ESG practices. Other asset owners will rely more heavily on external consultants and their investment managers for leadership on ESG and RI issues.

Norges Bank Investment Management, the Norwegian sovereign wealth fund, is an example of one of the leading asset owners in ESG integration. Currently, the Fund monitors greenhouse gas emissions in its equity portfolio and is looking to develop an in-house model to measure the impact of climate change on individual companies and portfolio returns. The New Zealand Superannuation Fund is another leading asset owner on the topic with a specific climate change strategy to: reduce exposure to fossil fuel reserves; incorporate climate change into

decision-making, manage climate risks by being an active owner; actively seeking new investment opportunities, such as renewable energy. Other leaders include Swedish fund AP4 and Dutch fund PGGM.

A number of forums and special working groups have been formed by the leading investors on the topic to facilitate collaboration amongst peers and to facilitate engagement with regulators and advisors. These initiatives include the Investment Leaders Group (ILG), a collection of investors and asset managers working with researchers at Cambridge University, and the One Planet Sovereign Wealth Fund Working Group, a collection of six sovereign funds brought together to help accelerate efforts to integrate financial risks and opportunities related to climate change.

While the majority of ESG integration has applied to infrastructure equity investments, the increased availability of ESG data and ratings has enabled several important innovations in the fixed income space like green bonds and social bonds. The main difference between equity investments and fixed income is that fixed income has an orientation towards managing downside default risk whereas equity is focused toward upside appreciation. Fixed income thus necessitates pursuing sustainability integration at a more fundamental level. While certain efforts have started to emerge in this space, more work is required to enable the adoption to be widespread.

In a recent survey conducted by the Callan Institute on 89 institutional investors in the US, it was found that more than 40% of respondents stated they have incorporated ESG factors into their investment decisions, up from 22% in 2013. Large investors, those with more than \$20 billion in assets, continue to be the highest ESG adopters by plan size. In 2018, 72% of the largest plans reported incorporating ESG factors, up from 33% in 2013, the first year the survey was conducted. That compares to 47% of funds with less than \$500 million that said they incorporated ESG factors, up from 20% in 2013 (Callan Institute, 2018).

Considering ESG factors with every investment/manager selection and communicating to investment managers that ESG is important to the plan were each cited by 55% of respondents as the top implementation methods for incorporating ESG factors. The top reasons cited for ESG incorporation were expectations to achieve an improved risk profile, according to 42% of respondents, up from 32% in 2017, followed by fiduciary responsibility and goals besides risk-adjusted returns at 34% each.

The top reasons cited for not incorporating ESG factors were that the investor does not consider factors that are not purely financial, according to 52% of respondents, followed by a lack of research tying ESG to outperformance (48%) and an unclear value proposition (21%).

A Morgan Stanley survey of 118 public and corporate pensions, endowments, foundations, sovereign wealth funds, insurance companies conducted in 2018 reported that 84% of respondents are pursuing or considering ESG investing. 70% of respondents are already incorporating ESG factors into their investment decisions. Risk management was cited as the biggest factor driving ESG adoption, according to 78% of asset owners, followed by return potential and mission alignment at 77% each (Morgan Stanley, 2018).

Only 42% of respondents said they felt their organization had adequate tools to assess how investments align with their sustainability goals. The remainder said they did not have adequate tools or were unsure. In terms of asset classes that provided the most attractive sustainable investment opportunities, the majority of respondents (65%) said public equities, followed by real assets (which includes infrastructure, agriculture and real estate) 50%; fixed income, 37%; private equity, 36%; and hedge funds, 7%. Only 50% of respondents agreed with the statement that they were satisfied with third-party investment managers' responses to ESG investing. Thirty-six percent said they neither agreed nor disagreed with the statement and the remainder said they disagreed.

With an understanding of the infrastructure investment value chain and some of the reasons institutional investors adopt sustainability reporting or decision making, the report now turns to the specific standards that have been developed to assess the sustainability of infrastructure investments.

2d. Standards included in this Study

Twelve different standards or evaluation tools were selected for inclusion in this desk study. This section includes a brief description of each, with the following sections including a more detailed review. These standards are differentiated not only by their specific methodology, but also by their level of analysis and applications. Some are primarily focused on individual projects or assets, while others are designed for assessing the aggregate environmental performance indicators of a portfolio of investments. Others still are applicable to a wider range of potential investments beyond infrastructure or real assets, though they were determined to be particularly applicable to the infrastructure sector. Finally, some of these assessments are not unique or proprietary, but act as aggregating tools for investors or developers, in some cases drawing on or utilizing some of the other standards included in this study to perform their analysis. All of the standards included in this study are applicable across infrastructure sectors, though many sector-based assessment tools also exist.

Each of the standards assessed are briefly described below. The sustainability standards in the study have been grouped at a very high level as either project screening tools or accounting tools based on the degree to which they are focused on accounting or performance rating at the project level vs aggregate accounting or reporting information at the portfolio level or across projects. These two general categories are useful for comparing the different types of tools available to infrastructure investors, but at the same time does not capture some of the nuances and differences between the various standards included in each category. We acknowledge that the types of standards looked at in this report are very different in nature and making comparability assessments can be very challenging. The primary purpose here is to provide a status report of some of the major standards being adopted in the field of infrastructure investment. This study is by no means comprehensive but provides a point of reference for further work to be done in improving tools and methods available.

Project Screening Tools

SuRe

The Standard for Sustainable and Resilient Infrastructure (SuRe) is a project certification standard developed by the Global Infrastructure Basel (GIB) Foundation in Switzerland, in collaboration with Natixis, a French investment bank. The SuRe certification includes 61 criteria across 14 themes and two general impact measurement reporting requirements. The criteria covers a wide range of environmental, social and governance aspects of a project, and certifications can be applied either post-design or post-construction. Developed by an international association, SuRe is designed to be useful to certify projects across regulatory regimes and in developing economies where regulatory requirements may vary.

ENVISION

Envision is an infrastructure project sustainability evaluation system that was developed jointly by the Institute for Sustainable Infrastructure (ISI) and Zofnass Program for Sustainable Infrastructure at Harvard University. The ISI is a nonprofit organization founded by the American Public Works Association (APWA), the American Society of

Civil Engineers (ASCE) and the American Council of Engineering Companies (ACEC). The Envision rating system includes 60 sustainability criteria, or credits. These are organized into five categories, including Quality of Life, Leadership, Resource Allocation, Natural World, and Climate and Risk. Envision has been predominantly used in the United States to date but may be adapted for international use.

CEEQUAL

The Civil Engineering Environmental Quality Assessment and Awards scheme (CEEQUAL) was first launched in 2003. In 2015 CEEQUAL was acquired by the BRE Group, which developed sustainability assessment tools for the real estate sector, and is thus currently undergoing a transition to be incorporated as one of BRE's certification products in 2018. CEEQUAL assesses nine different categories of a project's environmental management and impacts, with each category consisting of a series of point-scored questions that can be applied to different management practices and performance indicators. The CEEQUAL assessment has been widely used in the UK and Ireland and has more recently been used for some international infrastructure projects as well.

IFC Performance Standards

The IFC requires a risk management methodology consisting of eight Performance Standards for the projects it finances. The performance standards refer to the Environmental, Health and Safety project guidelines developed by the World Bank Group. The IFC performance standards have expanded beyond being applied to only IFC financed projects through the creation of the Equator Principles, which have been adopted by other financial institutions to apply the IFC performance standards to any projects they finance globally.

GRESB Infrastructure

GRESB Infrastructure is both a project-level and a portfolio-level assessment tool for asset owners like pension or superannuation funds and fund managers as well as the contractors or asset managers involved in the project individually. Data collected includes many management practice indicators in sustainability planning, eight categories of environmental performance indicators, and also general project performance metrics. For each performance indicator, the GRESB portal requests historical performance as well as target performance for future years. GRESB is grouped with the project-level ratings tools here, which it does provide, but it is also designed to aggregate information in a similar manner to the sustainability accounting tools.

Infrastructure Sustainability Council of Australia (ISCA) Rating Program

The Infrastructure Sustainability Council of Australia (ISCA) provides a project rating scheme for measuring sustainability in infrastructure projects. The assessment includes 16 different categories of governance, economic, environmental and social impacts. The metric can be applied to any infrastructure sector and is designed for projects greater than \$50mm in total budget. The ISCA system has been adopted by many public sector infrastructure agencies in Australia and New Zealand. It has not been applied in other regulatory regimes, but ISCA has recently developed a version of its assessment that can be used internationally.

Accounting Tools

Sustainability Accounting Standards Board (SASB) – Infrastructure

The SASB has developed industry specific accounting standards for sustainability issues to be integrated into standard reporting filings. The purpose of SASB is to provide corporations with a way to manage and disclose on sustainability issues, which enables investors to have the relevant information for decision-making that they can use to benchmark corporate performance on sustainability issues. Investors are able to use SASB tools to analyze and access the material sustainability information on companies in their portfolio as well as prospective investee companies. The resources available to investors include engagement guides, ESG integration insights, a climate risk bulletin and a Materiality Map which provides investors with a visual representation of their portfolio's exposure to specific sustainability risks.

Task Force on Climate-related Financial Disclosures (TCFD)

The FSB Task Force on Climate-related financial Disclosures (TCFD) is a task force set up by the Financial Stability Board to develop voluntary, consistent climate related financial risk disclosures and provide information to investors, lenders, insurers and other stakeholders. The purpose of the TCFD is to develop recommended disclosures for companies that would be useful for understanding material climate risks. The TCFD provide recommendations on the key metrics that should be used to measure and manage climate-related risks and opportunities specifically those associated with water, energy, land use, and waste management where relevant and applicable.

Lifecycle Assessment GHG Protocol Tool

The GHG Protocol was launched in 1998 to develop internationally accepted greenhouse gas (GHG) accounting and reporting standards and tools. The GHG Protocol corporate accounting and reporting standard document is separated into a number of key sections to help provide organizations with guidelines for reporting their GHG emissions. It covers the accounting and reporting of the six greenhouse gases covered by the Kyoto Protocol – carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF₆).

United Nations Sustainable Development Goals Indicators

The United Nations Sustainable Development Goals (SDGs) represent 17 goals and 169 targets that link the social, economic, and environmental dimensions of human development and well-being. While not being a standard specifically itself, the SDGs provide a framework that has guided a more definitive approach to the development of metrics in the broader field of impact and sustainable investment. We do not assess the SDGs as a standard but more as a framework and discuss briefly how the SDGS has led to the development of a variety of standards.

United Nations Principles of Responsible Investment

The six Principles for Responsible Investment are a voluntary and aspirational set of investment principles that offer a menu of possible actions for incorporating ESG issues into investment practice. The Principles were developed by investors. Membership of the UN PRI requires signatories to publicly report on their responsible investment activity through the UNPRI Reporting Framework. The UN PRI is supported by two other UN partners – UN Environment Program Finance Initiative (UNEP FI) and UN Global Compact.

CDC ESG Toolkit

The CDC ESG Toolkit for Fund Managers is designed to provide practical guidance to fund managers and others about how to assess and manage environmental, social and governance risks. A key part of the CDC tool kit are the sector profiles, for which infrastructure is included. The infrastructure sector profile helps fund managers familiarize themselves with the most frequent and important environmental, social and governance aspects of investments in infrastructure. The toolkit does not however provide investors with detailed technical guidance or specific standards to measure investments against.

2e. Evaluation Methodology

Each of the standards included in this desk study were qualitatively evaluated based on five dimensions – comprehensiveness, objectivity, clarity, transaction costs and finally traction. Each of these dimensions is detailed in this section. These dimensions were selected to clearly differentiate each of the standards in how they balance the natural tradeoffs between measuring all of the environmental, social and governance performance indicators and practices in an infrastructure portfolio in an objective or transparent manner, and other factors such as the ease of use or transaction costs associated with adopting the standard. Each of the standards assessed in this study managed these tradeoffs across a wide range of environmental factors and performance indicators.

The individual standard assessments were further focused on the degree to which each standard relied on the measurement of environmental performance indicators or sustainability practices, and in fact many of the standards rely on both. Environmental performance indicators are quantitative measures of specific environmental or social costs and benefits, such as CO₂ emissions or acres of habitat created or destroyed. Sustainability practices measure secondary factors that may or may not improve those performance indicators or the measurement of them, such as the appointment of a lead sustainability officer, the publication of environmental reports or the use of 3rd party sustainability audits for projects.

Finally, this review of the standards took care to assess the methodology through which each system collected and evaluated data from users for their analysis, as this has natural implications for our dimensions of objectivity and transaction costs. Data for assessments could be self-reported, subject to 3rd party review, or collected by the standard provider or a partner in its entirety. Each of the dimensions of the evaluation methodology are described in detail below.

Comprehensiveness

This dimension refers to the breadth of the standard in question along multiple axes. One of these is the specific environmental or social outcomes that are included in the standard. Another is the breadth of the sectors applicable to the standard, which will significantly impact its potential for general use. Infrastructure investment portfolios are sometimes specialized within specific geographies or sectors, but at the institutional level may cross disparate sectors and regions. These sectors are also extremely idiosyncratic in their environmental impacts or benefits, ranging from ports and oil pipelines to wetlands and wind farms. Any comprehensive standard must be able to cover these disparate sectors or have the capability of expanding to do so. The third proposed axis in the comprehensiveness assessment is the project lifecycle. This aims to measure each metric system's inclusion of environmental or social outcomes during different phases of a project – are impacts focused mainly on construction or can the standard be equally applied to project rehabilitation or operation?

Objectivity

This dimension measures each standard based on how data and conclusions are collected and communicated, and whether they can be standardized for evaluation by investors and other stakeholders. Here the intent is to evaluate standards based on whether they require data to be internally reported by investors or entail any 3rd party reviews or certifications. This should give a general indication of whether components of each standard are vulnerable to subjectivity. This dimension will also assess the specific methods by which data is reported under each standard, and whether assessments are developed in aggregate or “roll up” through service providers for each investment in a portfolio.

Clarity

Relating to the objectivity of the standard in question, the dimension of clarity entails the communicability and scalability of a standard for investors, stakeholders and the general public. Here the intent is to assess standards based on whether project or asset outcomes can be aggregated and used for portfolio-level reporting, and the relative transparency of assessments under the standard. As infrastructure portfolios are highly complex and idiosyncratic, covering a myriad of different assets and sectors, the clarity and communicability of any assessment system is critical to expanding that system’s utility beyond project-by-project, one-off assessments.

Transaction Costs

Like all forms of measurement and evaluation, sustainability standards naturally entail tradeoffs in transaction costs. Improving a standard’s comprehensiveness, objectivity and clarity entails balancing these aims against the costs of developing and maintaining that system for investors, which may be a barrier to greater adoption. The transaction costs of each standard are qualitatively assessed based on a comparative review of the actions required to implement them as well as supplemental data from specific adopters.

Traction

For each standard, the assessment includes a discussion of the standard’s traction in terms of adoption by investors or service providers to the extent that information is available.

2f. Detailed Standard Assessments

This subsection includes a detailed review of each of the standards included in this study. The subsequent section includes a summary discussion of this review in addition to an assessment of the current state of applying these standards in practice, based on industry interviews.

SuRe

Type: Project Screening Tool

Overview

The Standard for Sustainable and Resilient Infrastructure (SuRe) is a project certification standard developed by the Global Infrastructure Basel (GIB) Foundation in Switzerland, in collaboration with Natixis, a French investment bank. The GIB was created to develop standards like SuRe and provide education and capacity building tools in the development of sustainable infrastructure. GIB was founded in 2008 and the initial version of SuRe was launched in 2015. Version 1.0 of SuRe was published in late 2017 and the current version of the standard, version 1.1, was published in May 2018 following a review by the International Social and Environmental Accreditation and Labelling (ISEAL) Alliance, an association for international sustainability standards. SuRe is oriented toward infrastructure projects in developing economies.

SuRe is designed to be applied to a wide range of infrastructure sectors, including but not limited to water, energy, transportation, energy, mining, solid waste, and telecommunications. Certifications are completed jointly by project sponsors and independent 3rd party Certification Bodies (CBs). The GIB also offers a lower cost SmartScan assessment for small or early stage projects that does not result in a certification. SuRe certification is a 2-6 month process and certifications last for five years before requiring a re-certification.

The SuRe certification includes 61 criteria across 14 themes and two general impact measurement reporting requirements. The criteria covers a wide range of environmental, social and governance aspects of a project, and certifications can be applied either post-design or post-construction. The 14 themes are further grouped in dimensions of Governance, Society and Environment. SuRe certification is designed for project owners, whether they be investors or public sponsors.

How Investors Use SuRe

The six month certification process under SuRe begins with the project sponsor registering the project with SuRe and completing a self materiality assessment against the SuRe criteria. This provides the basic information which will be reviewed in the certification process. The project then selects a 3rd party CB to develop the full assessment. CBs are approved by GIB to carry out SuRe certifications, and the GIB does not develop certifications internally.

The CB and the project sponsor then develop terms and a timeline for certification, sign a contract and conduct a preliminary gap analysis of the project's performance under SuRe, based on the materiality self-assessment. The CB then conducts a 30 day public consultation of the results of the materiality assessment which is then used to refine the criteria and the project's scoring under SuRe. Finally, the CB appoints an auditing team to review the project certification, which includes a desk study and site visits. This culminates in a draft assessment report for the project, which includes non-conforming criteria and identifies corrective actions for the project.

Once the draft report is reviewed by the auditing team and the project sponsors to identify any corrections, a final report is issued and the GIB provides a recommendation to the CB as to whether the project should be certified. The ultimate authority to certify a project or not remains with the CB. Figure 3 shows an illustrative timeline of the project certification process.

Figure 3: SuRe Illustrative Certification Timeline (GIB, 2017)

Stage	Month	Milestone
0 Project Preparation (optional)	1-12 months before certification process begins	Project gets familiar with SuRe® criteria.
1 Registration	1	Project registered and information received.
2 Self-assessment	1	Self-materiality assessment complete.
3 Certification Body Engagement	1	Certification Body selected and engaged, gap analysis complete.
Public Consultation	1-2	30 for all stakeholders to comment.
4 Independent Third-Party Audit	2-3	Audit completed (desk reviews and site visits). Draft Report completed.
6 Final Report & Certification Recommendation	3-4	Final report issued and certification recommendation made.
7 Certificate Granted!	4-5	Certificate issued!

The GIB signs non-disclosure agreements with project sponsors to ensure sensitive information used to develop the certification is not available publicly. If a project is certified, it receives a bronze, silver or gold award based on its scores for various criteria and their materiality.

SuRe Scoring Methodology

In addition to categorizing criteria by theme, SuRe also classifies criteria based on whether they are a Management Criteria (MC), which are oriented towards sustainability practices, or a Performance Criteria (PC), which are oriented towards measuring environmental performance indicators. Scoring for MCs is binary, yes or no, while scores for PCs are based on level of performance if any points are awarded under that criteria. Performance Level 1 signifies performance above industry norms in that criteria, as well as clearly identifying and mitigating ESG risks. Performance Levels 2 and 3 signify zero net negative impacts for that criteria and positive net impacts for that criteria, respectively. SuRe further designates some of the criteria in its assessment as Red Criterion. These are criteria that must be met in order for certification to be achieved by the project. Table 1 lists the themes and criteria under SuRe, and their designations as MCs, PCs and Red Criterion.

Table 1: SuRe Criterion (GIB, 2018)

Governance
G1: Management and Oversight
G1.1: Organizational Structure and Management (MC)
G1.2: Project Team Competency (MC)
G1.3: Legal Compliance and Oversight (MC) (Red)
G1.4: Results Orientation (MC)
G1.5: Risk Management (MC)
G1.6: Infrastructure Connectivity and Integration (MC)
G1.7: Public Disclosure (MC)
G1.8: Financial Sustainability (MC)
G2: Sustainability and Resilience Management
G2.1: Environmental and Social Management Systems (MC) (Red)
G2.2: Life Cycle Approach (MC)
G2.3: Resilience Planning (MC)
G2.4: Emergency Response Preparedness (MC)
G2.5: Supply Chain (MC)
G2.6: Pre-existing Liabilities (MC)
G3: Stakeholder Engagement
G3.1: Stakeholder Identification and Engagement Planning (MC) (Red)
G3.2: Engagement and Participation (MC)
G3.3: Public Grievance and Customer Feedback Management (MC)
G4: Anti-corruption and Transparency
G4.1: Anti-Bribery and Corruption Management System (MC) (Red)
G4.2: Financial Transparency on Taxes and Donations (MC) (Red)
Society
S1: Human Rights
S1.1: Human Rights Commitment (MC) (Red)
S1.2: Human Rights Complaints and Violations (MC) (Red)
S1.3: Human Rights and Security Personnel (MC)
S2: Labor Rights and Working Conditions
S2.1: Employment Policy (MC)
S2.2: Ensuring Rights to Association and Collective Bargaining (MC)
S2.3: Non-discrimination (MC) (Red)
S2.4: Forced Labor and Child Labor (MC) (Red)
S2.5: Occupational Health and Safety (MC)
S2.6: Employee Grievance Mechanism (MC)
S2.7: Working Hours and Leave (MC)
S2.8: Fair Wages and Access to Employee Documentation (MC)
S2.9: Retrenchment (MC)
S3: Community Protection
S3.1: Minorities and Indigenous People (MC) (Red)
S3.2: Resettlement (MC) (Red)
S3.3: Cultural Heritage (MC)
S3.4: Decommissioning and Legacy: Risks to Future Generations (MC)
S3.5: Management of Public Health and Safety Risks (MC) (Red)

Society (cont.)

S4: Customer Focus and Community Involvement

- S4.1: Physical Accessibility (MC)
- S4.2: Provision of Basic Infrastructure Services (PC)
- S4.3: User Affordability (MC)
- S4.4: Delivery of Public Health and Safety Benefits (PC)

S5: Socioeconomic Development

- S5.1: Direct Employment and Training (PC)
- S5.2: Indirect/Direct Economic Development Enabled by the Project (PC)
- S5.3: Gender Equality and Women Empowerment (MC)

Environment

E1: Climate

- E1.1: Climate Change Mitigation (PC) (Red)
- E1.2: Climate Change Adaptation (PC) (Red)

E2: Biodiversity and Ecosystems

- E2.1: Biodiversity and Ecosystem Management (MC) (Red)
- E2.2: Biodiversity and Ecosystem Conservation (PC) (Red)
- E2.3: Invasive Alien Species (MC)

E3: Resource Management

- E3.1: Responsible Sourcing of Water (MC) (Red)
- E3.2: Water Efficiency (PC) (Red)
- E3.3: Responsible Sourcing of Materials (PC)
- E3.4: Resource Efficiency (PC) (Red)
- E3.5: Waste Management (PC)

E4: Pollution

- E4.1: Air and Soil Pollution (PC) (Red)
- E4.2: Water Pollution (PC) (Red)
- E4.3: Pest Management (MC)
- E4.4: Noise, Light, Vibration and Heat (PC)
- E4.5: Cumulative Impacts (MC)

E5: Land Use and Landscape

- E5.1: Location, Project Siting and Design in Relation to Landscape (MC)
- E5.2: Land Use (PC)
- E5.3: Soil Restoration (MC)

Instead of using a point system to aggregate total project scores, during the materiality assessment early in certification SuRe determines materiality levels for each of its criteria for the project. Each criteria is awarded a materiality of high, medium, low or not material. The materiality of a criteria for a project is determined based on a combination of the criteria's importance given the context of the project and the potential for the project to impact that criteria. Thus, every project certified under SuRe will be assessed differently based on its context and the relative materiality of different criteria for the project.

Projects then receive a bronze, Silver or Gold rating from SuRe based on their performance and the materiality of the criteria they achieve. All red criteria must be complied with for any level of certification. For example, in order to achieve a silver criteria a project must comply with all red criteria, all high materiality criteria, 80% of medium materiality criteria and 10% of low materiality criteria in addition to scoring a minimum of performance level 2 for 80% or high materiality PCs and 50% of medium materiality PCs.

For the PCs included in the SuRe assessment, some of these are performance indicators directly, while others are scored based on performance relative to a benchmark. Level 1 performance in Climate Change Mitigation, is achieved when the project demonstrates that it produces lower carbon emissions than allotted for a comparable project, while level 2 and 3 performance are for net zero and net negative emissions. The PC of Water Efficiency is more directly tied to performance indicators, as each performance level is determined based on the storm risk at which the project would be unable to treat storm water, the relative increase in water storage capacity for the area due to the project, and percentage of its outdoor water needs that are met using captured rainwater or recycled grey water.

Assessment of SuRe as an Infrastructure Sustainability Standard

Comprehensiveness

SuRe is designed to be extremely comprehensive in terms of the geographies in which it can be applied, and specifically within developing economies. In part because of this, it includes many criteria that are not included in other assessments, such as those involving human rights and labor laws, which would otherwise be protected by regulations in developed economies. SuRe's assessment is further comprehensive in that, with 61 different criteria, it assesses virtually all aspects of a project's environmental, social and governance impacts.

Because many of the criteria scores in SuRe are process or practice based, and because those that are based on performance indicators are predominantly benchmark based, it is unclear whether ratings under SuRe could roll up to provide portfolio-level insights for an investor across regions. *Assessment: Maximizes comprehensiveness in being universally applicable across regions. Potential users mainly limited to project sponsors and governments.*

Objectivity

SuRe achieves objectivity through process, as opposed to through the metrics themselves. It requires a complete 3rd party development of project scores along with a public comment process and a review/recommendation from GIB. Relative to other project assessments, SuRe has an extremely objective and transparent ratings process.

This compensates somewhat for a less objective metric system, due to both materiality and criterion heavily weighted towards management practices and benchmarks. The decision to incorporate materiality assessments into ratings accounts for the unique and differentiated nature of infrastructure projects, but it does add a layer of subjectivity to each project rated under SuRe. The use of benchmarks in environmental performance indicators, while also understandable to render SuRe applicable across regions, also adds a layer of subjectivity to SuRe assessments. These more subjective elements of the SuRe metric account for the importance of context in rating the sustainability of infrastructure investments. *Assessment: More subjective metric system balanced against a transparent, objective rating process.*

Clarity

GIB provides detailed documentation on the requirements necessary to meet each criteria in its assessment. For the criteria driven by environmental performance indicators, the scoring methods are clear and GIB provides some additional resources that can be used by CBs in developing benchmarks. As SuRe is a relatively very new assessment standard, time will tell if the use of materiality and red criterion in the assessment impact rating and reporting clarity in any way. The use of red criterion is unique for SuRe in that it designates criteria that must be

met in order to achieve a rating. This is useful to establish a minimum baseline for ESG practices, but may prohibit adoption of the rating standard for projects if sponsors are wary of meeting any of these criteria. Materiality assessments could have a similar effect, in that project sponsors could complete materiality assessments and then decline to complete the rating based on the results, and their estimate of whether they can achieve a certification. *Assessment: Metrics and methodology are clearly delineated. Aggregate ratings may be less clear across projects due to materiality and ratings system that may bias project sponsor in rating selection.*

Transaction Costs

Beyond their costs to gather information to complete the assessment, and any costs of complying with SuRe's requirements, project sponsors must pay the CB to complete its certification. SuRe does not set the prices of certifications directly as these are negotiated between the sponsor and the CB. However, SuRe estimates a range of certification costs as between \$30,000 and \$60,000 depending on the size of the project and its stage of development. Transaction costs should be somewhat higher for SuRe certification relative to other project assessments due to the likelihood that more on-site inspections will be required, which is partially a product of SuRe's international focus. *Assessment: High relative to other project certifications, but relatively small in terms of total project costs.*

Traction

Version 1.0 of SuRe was only launched this year. According to its website, no projects have been certified under SuRe to date. *Assessment: Too early to assess traction / no traction.*

ENVISION

Type: Project Screening Tool

Overview

Envision is an infrastructure project sustainability evaluation system that was developed jointly by the Institute for Sustainable Infrastructure (ISI) and Zofnass Program for Sustainable Infrastructure at Harvard University. The ISI is a non-profit organization founded by the American Public Works Association (APWA), the American Society of Civil Engineers (ASCE) and the American Council of Engineering Companies (ACEC). The Envision rating system is designed to help incorporate sustainability considerations into infrastructure planning, development and management. It can be used on all types of infrastructure projects, including roads, bridges, pipelines, levees, railways, airports, dams and water treatment plants.

The Envision system includes a pre-assessment checklist for early stage planning accompanied by a more specific rating system once more details of the project are known. The system also provides the option of 3rd party verification, which makes a project eligible for awards. The Envision rating system includes 60 sustainability criteria, or credits. These are organized into five categories, including Quality of Life, Leadership, Resource Allocation, Natural World, and Climate and Risk. Envision aims to ask not only "Are we doing the project right?" but also "Are we doing the right project?"

Envision is not designed for use only by infrastructure investors, but can be used to assess a project by any participant in the infrastructure value chain, including environmental or community groups and regulators.

How Investors Use ENVISION

Users can take online or in-person certification courses from ISI to be a credentialed user of Envision. This is not required for a self-assessment of a project, which is offered for free, but is required for making a project eligible for an Envision award via the verification process. To assess a project, investors or other participants can create the project in Envision's online portal and provide basic project information. This is followed by a series of questions and supplemental documentation requests that address each of the Envision credits and their evaluation criteria. The evaluation criteria under each credit are generally either yes/no actions or accomplishments, such as conducting a particular evaluation or study, or a target, such as whether or not a certain percentage of the project's materials come from recycled sources. Documentation must be provided to support most of the evaluation criteria.

Table 2 lists the categories and subcategories of Envision's credits, with scores developed for each credit and aggregated at the category and project level.

Table 2: Envision Credits (ISI, 2018)

Quality of Life	
1.	Purpose
	QL1.1: Improve Community Quality of Life
	QL1.2: Stimulate Sustainable Growth and Development
	QL1.3: Develop Local Skills and Capabilities
2.	Wellbeing
	QL2.1: Enhance Public Health and Safety
	QL2.2: Minimize Noise and Vibration
	QL2.3: Minimize Light Pollution
	QL2.4: Improve Community Mobility and Access
	QL2.5: Encourage Alternative Modes of Transportation
	QL2.6: Improve Site Accessibility, Safety and Wayfinding
3.	Community
	QL3.1: Preserve Historic and Cultural Resources
	QL3.2: Preserve Views and Local Character
	QL3.3: Enhance Public Space
Natural World	
1.	Siting
	NW1.1: Preserve Prime Habitat
	NW1.2: Protect Wetlands and Surface Water
	NW1.3: Preserve Prime Farmland
	NW1.4: Avoid Adverse Geology
	NW1.5: Preserve Floodplain Functions
	NW1.6: Avoid Unsuitable Development on Steep Slopes
	NW1.7: Preserve Greenfields
2.	Land and Water
	NW2.1: Manage Stormwater
	NW2.2: Reduce Pesticides and Fertilizer Impacts
	NW2.3: Prevent Surface and Groundwater Contamination
3.	Biodiversity
	NW3.1: Preserve Species Biodiversity
	NW3.2: Control Invasive Species
	NW3.3: Restore Disturbed Soils
	NW3.4: Maintain Wetland and Surface Water Functions
Leadership	
1.	Collaboration
	LD1.1: Provide Effective Leadership and Commitment
	LD1.2: Establish a Sustainability Management System
	LD1.3: Foster Collaboration and Teamwork
	LD1.4: Provide for Stakeholder Involvement
2.	Management
	LD2.1: Pursue By-Product Synergy Opportunities
	LD2.2: Improve Infrastructure Integration

Leadership (cont.)

3. Planning
 - LD3.1: Plan for Long-Term Monitoring and Maintenance
 - LD3.2: Address Conflicting Regulations and Policies
 - LD3.3: Extend Useful Life

Climate and Risk

1. Emissions
 - CR1.1: Reduce Greenhouse Gas Emissions
 - CR1.2: Reduce Air Pollutant Emissions
2. Resilience
 - CR2.1: Assess Climate Threat
 - CR2.2: Avoid Traps and Vulnerabilities
 - CR2.3: Prepare for Long-Term Adaptability
 - CR2.4: Prepare for Short-Term Hazards
 - CR2.5: Manage Heat Island Effects

Resource Allocation

1. Materials
 - RA1.1: Reduce Net Embodied Energy
 - RA1.2: Support Sustainable Procurement Practices
 - RA1.3: Use Recycled Materials
 - RA1.4: Use Regional Materials
 - RA1.5: Divert Waste from Landfills
 - RA1.6: Reduce Excavated Materials Taken Off Site
 - RA1.7: Provide for Deconstruction and Recycling
2. Energy
 - RA2.1: Reduce Energy Consumption
 - RA2.2: Use Renewable Energy
 - RA2.3: Commission and Monitor Energy Systems
3. Water
 - RA3.1: Protect Fresh Water Availability
 - RA3.2: Reduce Potable Water Consumption
 - RA3.3: Monitor Water Systems

ENVISION Scoring Methodology

Each of Envision's 60 credits for a projects are awarded point scores based on five different levels of achievement. Additional points may be awarded for innovative practices in each of the five categories. For each credit, Envision provides specific guidance on what would constitute each of the five levels of achievement. The five potential levels of achievement for each credit include:

1. *Improved*: Performance that exceeds regulatory requirements or is above conventional.
2. *Enhanced*: More sustainable performance.
3. *Superior*: Noteworthy sustainable performance within that credit, but still has some negative environmental impacts.
4. *Conserving*: Essentially net zero negative environmental impacts
5. *Restorative*: Net positive environmental impacts, or restoration of natural or social systems.

For a given level of achievement in a credit, a project will be awarded points, but the number of points awarded will vary based on the credit based on Envision's weighting of the importance of the credit. For example, a *Restorative* level of achievement for the credit "Enhance Public Space" would award a project 13 points, while the same level of achievement for the credit "Preserve Greenfields" would award a project 23 points. There are 809 possible total points for a project in the assessment.

Some of the credits in Envision determine levels of achievement based on environmental performance indicators, and others primarily base scores on management practices. Others still base scores on some combination of practices and performance indicators. For the scores based on performance indicators, many scores are based not on the performance indicator directly, but rather on whether the project sponsor can demonstrate that they altered the design or operations of the project in a way that improved performance.

The credit for "Reduce Greenhouse Gas Emissions" is an indicator of how these methods are combined in Envision to produce a level of achievement and point score. An *Improved* level of achievement (4 points) is determined based on process – whether the project sponsor completed a life-cycle carbon assessment. The *Enhanced* and *Superior* levels of achievement (7 and 13 points, respectively) are linked to performance indicators indirectly, by the project sponsor demonstrating that design changes were used to reduce greenhouse gas emissions by 10% and 40% relative to a baseline. The *Conserving* and *Restorative* levels of achievement (18 and 25 points, respectively) are directly linked to performance indicators, and are for carbon neutral or net carbon negative projects.

Many of Envision's credits are linked to others, and these are noted in the assessment. Thus, actions that primarily benefit one of the credit may result in improved scores across others. For example, the credit to "Maintain Wetland and Surface Water Functions" is scored based on the number of ecosystem functions (hydrologic connection, water quality, habitat, and sediment transport) enhanced by the project. Improvements to any of these functions would also increase a project's score in other credits, such as preserving habitat and floodplains or managing stormwater. For verified projects, Envision awards Bronze, Silver, Gold and Platinum recognitions to projects that score 20%, 30%, 40% and 50% of the total applicable points available.

Assessment of ENVISION as an Infrastructure Sustainability Standard

Comprehensiveness

With 60 different credits in the assessment, Envision provides a very comprehensive assessment of virtually all of the different environmental, social and governance aspects of an infrastructure project, from carbon emissions to community public spaces and views. It is also tailored to be applied to a wide range of infrastructure sectors. Envision is fairly focused on scoring project management practices and its scoring is weighted towards incentives for best practices in assessing environmental impacts and incorporating environmental factors into project planning, development and management. Envision is also comprehensive in that it is designed to be used by groups and organizations across the infrastructure value chain, with components of the assessment clearly designed to require input from stakeholders, design firms, construction firms, material supplies and public sponsors.

For institutional investors and asset managers, because Envision is focused on the development of project-level scores, it is unclear whether they could easily "roll up" to provide portfolio-level insights. The metric system is also tailored to the US or Canadian infrastructure markets, though ISI states that it could easily be adapted to assess projects in other regions, and the system has also been used for several projects in Latin America. This is partially driven by the fact that Envision's scoring system for many credits is indirectly related to performance indicators

by awarding points for performance improvements relative to a benchmark, and many of these benchmarks are derived from US environmental regulations or standards. Components of the credit to “Reduce Air Pollutant Emissions,” for instance, are partially based on the US National Ambient Air Quality Standards, or air quality standards in California. *Assessment: Extremely comprehensive in terms of topics assessed and potential users. Potentially less so in the potential for portfolio-level assessments that include both US and international projects.*

Objectivity

Through the verification process, Envision requires an objective, independent 3rd party review of each project to develop levels of achievement in each credit and total scores. This is required for any project to be eligible for an Envision award, and significantly limits the subjectivity of scores through that process. This may be necessary in part because some of the achievement level criteria in Envision credits are naturally subjective. Scores for the credit to “Provide for Stakeholder Involvement,” as one example, are based on the degree to which the project gets stakeholder feedback and its frequency, and the applicant’s ability to demonstrate that changes to the project were made in response to community input. Envision addresses the subjectivity in some of these credits by requiring an independent verification process.

Like many other assessment standards, the degree of subjectivity of any of the scores is largely driven by the competing objectives of measuring environmental performance indicators and incentivizing best practices in sustainable project management and design. This necessitates some subjectivity when scores are aggregated at the project level. In other words, lower scores on credits driven by environmental performance indicators could be offset by scores for credits driven more by practices. This is largely unavoidable in an assessment that combines the two. *Assessment: At the credit level, Envision’s objectivity is achieved through 3rd party reviews for all projects. Project level scores combine environmental practices and performance indicators.*

Clarity

ISI provides documentation describing in detail how each credit is assessed and how levels of achievement are determined. There is less public documentation of how Envision credit weightings (the number of points awarded per level of achievement in each credit) were determined, though this was presumably based on the relative importance of that credit to overall environmental performance. Through 3rd party verification, project sponsors themselves receive considerable, detailed feedback on which credits received high scores in their assessment and which did not. However, the aggregated score for each project naturally entails less detail as to which credits are driving a project’s performance in Envision. *Assessment: Aggregate scores for project naturally entail a loss of some clarity, but project sponsors receive detailed information through the assessment and verification process.*

Transaction Costs

Envision is funded through membership fees from organizations, training fees, and verification fees. Members receive discounted pricing on the other transaction costs. The only other transaction costs associated with Envision are any resources required by companies to actually complete the assessment. Improving scores under Envision may result in other costs to document or implement design or management changes, but these are directly related to improving sustainability performance that Envision measures. The most significant transaction costs for a project are thus the fees for verification, which can be completed either post-design or post-construction. Total verification fees for a project range from \$11,000 to \$56,000, depending on the size of

the project in total budget. For projects with a total size of more than \$1bn ISI develops a specific price quote for verification. *Assessment: Transaction costs limited unless sponsors opt for verification.*

Traction

More than 275 companies have joined as Envision members since its launch in 2015. In terms of projects, much of Envision's traction has been in North America, with the first assessment of a project in Europe currently underway.

Traction: Growing fast, though currently limited geographically.

CEEQUAL

Type: Project Screening Tool

Note: This summary and assessment is based on CEEQUAL Version 5. A new version of CEEQUAL was in development at the time this desk study was completed.

Overview

The Civil Engineering Environmental Quality Assessment and Awards scheme (CEEQUAL) was first launched in 2003, making it one of the oldest project evaluation and screening tools globally. In 2015 CEEQUAL was acquired by the BRE Group, which developed sustainability assessment tools for the real estate sector, and is thus currently undergoing a transition to be incorporated as one of BRE's certification products with a focus on infrastructure development. CEEQUAL is predominantly used in the UK and Ireland, and has one version of the assessment that is based on environmental regulations and standards there and another version for international infrastructure projects based on international best practices. CEEQUAL also has a separate assessment methodology for term contracts, or projects that are longer term maintenance or small works contracts that are based on a specific duration or geographical area.

CEEQUAL uses a three-pillar model of sustainable development to delineate the areas in which its assessment focuses. The pillars include Environmental Quality, Social Success and Economic Success. CEEQUAL is designed to assess all aspects of environmental quality and most aspects of the other two pillars, thus supplementing the client's economic analysis and the public sector planning process in assessing economic and social success.

CEEQUAL can be used by sponsors of infrastructure development in the public or private sector, as well as design firms for early stage assessments or construction firms for construction and design assessments. CEEQUAL categorizes these awards differently based on the stage at which the assessment is completed and how many phases of the project it encompasses. The Whole Team Award applies to the project sponsor and the project design and construction phases, but CEEQUAL also offers Design, Construction, Design & Construction or Client & Design awards if the assessment is only completed on one or a few phases of the project.

A goal of CEEQUAL is to measure project performance above and beyond that required by regulation, including project actual, not forecast, performance as forecasts of environmental impacts are often evaluated through public sector environmental approval processes. CEEQUAL is thus closely tied to the environmental approval process in the UK, and can be used to demonstrate environmental performance in that process, though performance scores in CEEQUAL are determined in part by the degree to which the project performs above and beyond that which is required by regulation.

How Investors Use CEEQUAL

CEEQUAL assessments are completed by assessor's and verifiers. The assessor is a member of the project team that has completed a certification by CEEQUAL, and completed a self-assessment for the project using an online assessment tool. The verifier is also certified by CEEQUAL but is an independent 3rd party without another interest in the project. Once these are appointed the assessment starts with a scoping process to account for materiality, in which the assessor proposes a set of CEEQUALs evaluation questions that are relevant to the project for the verifiers approval. The assessor then completes the self-assessment and the verifier reviews it and the supporting evidence, including site visits, and submits the verified assessment to CEEQUAL for ratification and award.

The CEEQUAL assessment covers nine sections, which vary by the type of assessment and contract being assessed. Table 3 lists the areas addressed by CEEQUAL.

Table 3: CEEQUAL Assessment Sections (CEEQUAL, 2015)

1.	Project or Contract Strategy (Optional)
2.	Project and Contract Management
3.	People and Communities
4.	Land Use (above and below water) and Landscape
5.	The Historic Environment
6.	Ecology and Biodiversity
7.	Water Environment (Fresh and Marine)
8.	Physical Resources Use and Management
9.	Transport

Each area includes a series of questions with a point scoring rubric based on the stage or party of the project it applies to. The CEEQUAL assessment manual further provides three forms of guidance for developing scores: some question guidance to determine how to assess each score, some evidence guidance describing appropriate documentation required to justify the score, and scope-out guidance to help assessors determine if the project can be removed from the assessment based on materiality. Each question differs in its scoring based on the applicability to the parties involved in the contract. For example, the management practice indicator of whether there are training programs in place on environmental or social impact awards 39 points in total, with 13 points each if programs are in place for the client, the design firm, and the construction contractor. Other questions only apply to certain phases or parties involved in the contract. In CEEQUAL, documentation and evidence is required to support any points earned.

CEEQUAL Scoring Methodology

Total CEEQUAL scores and ratings are determined by the percentage of points awarded out of the total possible, which varies based on which factors are determined to be material for the project in question. A project with a Pass rating achieves 25% of the possible points, with Good, Very Good, and Excellent ratings for 40%, 60% and 75% scores respectively. The materiality assessment at the beginning of the review is used to determine the total possible points. Materiality in CEEQUAL is used to eliminate questions or factors that are not relevant to the project, but does not change the point weighting of the questions included in the assessment. Furthermore, many of the specific questions in CEEQUAL are classified as “NSO” in that they cannot be scoped out of the assessment for any project.

The individual question scores in CEEQUAL are predominantly based on management practices, and those that are based on environmental performance indicators are, for the most part, scored based on an improvement in environmental performance over a baseline for the project. The assessment for Energy and Carbon, for instance, (in CEEQUAL Version 4) contains 16 questions. The vast majority of these are based on management practices

during the design, construction and operations phases of the project, such as the use of energy reduction plans in design and during construction, or the completion of a life-cycle energy assessment, or the use of renewable energy. The only questions related to a performance indicator are based on the percentage of energy consumption reduction and the percentage of carbon emissions reduction identified in the life-cycle assessment that is actually incorporated in the completed project.

There are 2000 points possible in a CEEQUAL assessment less any questions that are scoped out of the assessment for materiality. These are spread throughout the nine assessment areas and point ratings for individual questions are regularly updated by CEEQUAL via industry consultation.

Assessment of CEEQUAL as an Infrastructure Sustainability Standard

Comprehensiveness

CEEQUAL provides an extremely comprehensive assessment process with ample evidence and detailed guidance in assigning point scores and evaluating evidence. The assessment areas cover all major aspects of environmental impacts for infrastructure projects. CEEQUAL scores are focused somewhat on sustainable management practices throughout the project development process, and its scoring methodology that is broken down by project phase enables assessments to be completed during scoping, design and/or after construction depending on the party that wishes to complete the assessment. CEEQUAL is somewhat limited in its potential application internationally, as many of the metrics and guidance standards are based on UK and Ireland environmental regulations, however the more recent development of an international rating program may enable an investor with a portfolio of project both in and outside the UK to implement the assessment more broadly. *Assessment: Very detailed scoring standards and methodology. Comprehensive in its potential use by multiple parties involved in a project and at different points during the project lifecycle.*

Objectivity

An independent 3rd party acts as a verifier for every CEEQUAL rating. This limits the subjectivity of some of the management practice questions. Some of these questions are entirely objective, while others entail some subjectivity in reviewing evidence that certain environmental impacts were accounted for in planning. Like some other assessment metrics, CEEQUAL incorporates some subjectivity in order to further its objective of promoting sustainable management practices above and beyond those required by regulation. This combination of practice-based scores and performance indicator-based scores renders it difficult to determine which factors are driving the projects overall rating. This is largely unavoidable in an assessment that combines the two. *Assessment: Objectivity promoted through 3rd party review. Some subjectivity inherent in management practice scoring and in overall project assessments.*

Clarity

CEEQUAL provides extremely detailed information on determining individual area scores and assessing materiality. It provides less documentation on how the point weighting of the individual questions were determined and why some were determined to be more significant than others, presumably due to their estimated environmental impacts. The combination of management practices and performance indicators without a clear delineation between them may make it more difficult to determine which factors drive the ratings

for a project when they are combined. *Assessment: Very clear and detailed guidance for determining scores for individual questions. Project level ratings combine management practice and performance indicator scores.*

Transaction Costs

CEEQUAL provides a fee scale based on the size of the project in total value and the type of assessment completed. Design or construction only awards generally have a lower fee than a rating on a combination of the design and construction or design and client, and the whole team project ratings have the highest fee. The international project ratings also have a slightly higher fee than projects in the UK or Ireland. Fees range from under £5,000 for very small projects to more than 45,000 for projects with a total value of more than 900mm. Projects with a total value of more than 1bn have a negotiated fee. Other transaction costs associated with a CEEQUAL rating include having staff trained in completing the rating and any costs associated with improving or documenting scores. *Assessment: Medium transaction costs relative to other project screening tools.*

Traction

CEEQUAL is the oldest of the project screening metrics included in this study, and has ample traction across sectors. It has been used for hundreds of projects ranging from transportation, energy, water and social infrastructure. During its first few years as a screening tool the project was used to certify approximately 24 projects between 2003 and 2007 before significantly increasing its rate of adoption, at least in terms of number of projects per year. The vast majority of CEEQUAL projects have been in the UK. The metric has been used for approximately 13 international projects, predominantly in other parts of Europe and Hong Kong. *Assessment: Strong traction, mostly limited to the UK.*

IFC Performance Standards, Equator Principles and World Bank EHS Guidelines

Type: Project Screening Tool

Overview

The International Finance Corporation (IFC)¹ has developed a risk management methodology consisting of eight Performance Standards, compliance for which are required for projects financed by the IFC. The first Performance Standards were released in 2006 with a second set being released in 2012. The initial standards were based on the World Bank's environmental safeguards that had been in place since 1998 and build upon the policy of the Bank to embed sustainable development in their investment decision making and management of projects.

Since 2012, all PPP infrastructure projects where the IFC played a role in are screened against the Performance Standards and where gaps are identified, recommendations are made to align them with the standards. The performance standards have become a global benchmark to determine, assess and manage Environmental and Social risks in project financing.

There are eight performance standards that summarize the IFC's responsibilities for managing environmental and social risks. The standards include:

1. Assessment and Management of Environmental and Social Risks and Impacts
2. Labor and Working Conditions
3. Resource Efficiency and Pollution Prevention
4. Community Health, Safety, and Security
5. Land Acquisition and Involuntary Resettlement
6. Biodiversity Conservation and Sustainable Management of Living Natural Resources
7. Indigenous People
8. Cultural Heritage

The Performance standards refer to the Environmental, Health and Safety (EHS) guidelines developed by the World Bank Group, as a technical reference for the implementation of the IFC Performance Standards. The objective of the EHS guidelines is to provide guidance on common environmental and safety issues potentially applicable to different industries. There are EHD guidelines specifically related to all major infrastructure sectors including: airlines, airports, crude oil and petroleum product terminals, gas distribution systems, health care facilities, ports, harbors and terminals, railways, retail petroleum networks, shipping, telecommunications, toll roads, tourism and hospitality development, waste management facilities, water and sanitation. Power, oil and gas are covered separately.

The use of the IFC Performance Standards have expanded from just being used for IFC projects to becoming a de facto benchmark for environmental and social issues for the financial industry. This expansion has taken hold for the investment industry as a whole through the creation of the Equator Principles, which are an agreement between over 90 financial institutions in 37 countries to apply the IFC performance standards particularly in jurisdictions where

¹ The International Finance Corporation (IFC) is part of the World Bank Group and finances private sector projects in the developing world. It was established in 1956. IFC finances projects across many sectors including: agribusiness, financial markets, health and education, infrastructure, manufacturing and services, oil, gas and mining, ICT.

environmental and social issues may not be adequate. The Equator Principles have been accepted as a move towards establishing an industry norm for managing environmental issues.

The IFC performance standards in many ways can be considered a private regulatory framework. Many financial institutions incorporate the IFC performance standards in their contractual documentation. For example, borrowers from these banks are required to meet the requirements of the IFC performance standards. The main difference between the IFC Performance Standards and government regulation is that there is no formal oversight over the use of the standards. Oversight is conducted by the financial institution itself or by the IFC.

How Investors use the Performance Standards and EHS Guidelines

The IFC's Performance Standards essentially provide guidance on how to identify risks and impacts against the 8 broad categories depicted through each standard, specifically with regards to stakeholder engagement and disclosure obligations of investors and project managers. The EHS guidelines are tailored for specific sectors or projects, where investors are able to understand the industry specific impacts, obtain the relevant performance indicators and monitoring and get access to additional references and sources.

An infrastructure investor is able to obtain the EHS guidelines for most asset types that they would be looking to invest into and be able to appraise the potential investment against the relevant EHS guidelines. As an example, the EHS guidelines for Toll Roads are split into 3 separate sections:

Industry-Specific Impacts and Management provide a summary of EHS issues associated with road projects, which occur during the construction and operation phase, along with recommendations for their management. Environmental issues in the EHS specific to the construction and operation of roads include: habitat alteration and fragmentation, stormwater, waste, noise, air emissions and wastewater. The considerations of both road construction and right of way maintenance are outlined in the guidelines as it pertains to the five areas above. Details are provided for the specific processes carried out, such as road paving, road deicing, resurfacing, painting. Certain aspects for roads are referred to in the general EHS guidelines. For example, air emissions guidelines related to dust from construction and maintenance activities are described in the general EHS guidelines as are the exhaust emissions from vehicles. The general EHS guidelines outline the amount of pollutant concentrations that should be adhered to as per WHO air quality guidelines.

The second section of the EHS guidelines for toll roads contain performance indicators and monitoring. In the environmental section under emissions and effluent guidelines, reference to the general EHS guidelines is given as roads do not typically give rise to significant point source air emissions or effluents. The monitoring section of the EHS guidelines provide information on monitoring parameters, baseline calculations, monitoring type and frequency, monitoring locations. Much of this information utilizes references from United Nations Framework Convention on Climate Change, the Intergovernmental Panel on Climate Change and the United States Environmental Protection Agency.

The Equator Principles is a risk management framework made up of ten principles that facilitate the process of determining, assessing and managing environmental and social risk in financing major infrastructure projects. It provides a minimum standard for due-diligence to support responsible risk decision-making. The ten principles: Review and Categorization, Environment and Social Assessment, Applicable Environmental and Social Standards, Environmental and Social Management System and Equator Principles Action Plan, Stakeholder engagement,

grievance mechanism, independent review, covenants, independent monitoring and reporting, reporting and transparency.

The Equator Principles Financial Institutions (EPFI) apply the Equator Principles to new projects financed by four financial products:

- Project Finance Advisory Services for projects with total costs \$10m or more;
- Project Finance with total Project capital costs of \$10m or more;
- Project-Related Corporate Loans where the majority of the loan is related to a single project over which the client has effective operational control, the total aggregate loan amount is at least \$100m, the EPFI's individual commitment is at least \$50m, the loan tenor is at least two years;
- Bridge Loans with a tenor of less than two years that are intended to be refinanced with project Finance as per the above criteria.

The EPFI framework offers relevant thresholds and criteria for application and relevant guidelines when analyzing deal flow. The framework is applied to new projects and to the expansion and upgrade of existing projects.

The environmental and social categories of the Equator Principles also refer to the EHS guidelines of the World Bank for technical guidelines on environmental assessments and monitoring. Also, as an example, the EPFI requires clients to report GHG emissions 'in accordance with internationally recognized methodologies and good practice' such as the GHG Protocol. The alternatives analysis requires the evaluation of technically and financially feasible and cost effective options available to reduce project-related GHG emissions during the design, construction and operation of the Project.

Assessment of IFC Performance Standards as an Infrastructure Sustainability Standard

Comprehensiveness

The IFC Performance Standards and Equator Principles provide broad coverage of most infrastructure sectors through the EHS Guidelines. The EHS guidelines includes coverage across all major infrastructure sectors but also has dedicated guidelines for the mining, oil and gas, and power sectors. On top of these specific sectors, there are also general guidelines that could be applied to almost any project. While the projects had initially been focused on emerging economy projects, the framework has been extended to be applied around the world. The specific metrics used draw upon the best practice guidelines developed by other relevant entities such as the WHO, IPCC and EPA. The IFC Performance Standards and Equator Principles framework can be applied to both new (greenfield projects) as well as for maintenance on existing projects. *Assessment: Comprehensiveness Level – very high. Has flexibility to cover almost any infrastructure project.*

Objectivity

The IFC performance standards were initially used by the IFC for projects that they invested in and would use the standards as a condition for investment. The clients of the IFC would need to bring the projects in line with the standards. In this way the IFC could be seen as a regulatory body for their infrastructure investments. When adopted by other investors, the standards can be seen as objective in that the IFC is a well-recognized third party with substantial experience of infrastructure investing. There may be an element of subjectivity associated with appraising investments as the reporting would be done by the investor themselves. *Assessment: Objectivity level – medium*

Clarity

The IFC performance standards are varied and wide reaching as indicated by the breadth of projects that the IFC have investments in. The standards have enough depth to be comprehensive in being applied to individual projects but could also be applied across a portfolio of infrastructure projects. Given the wide range of stakeholders of the IFC, the standards are also comprehensive in addressing the needs of a wide range of actors that could be affected by the infrastructure projects in focus. Despite this however, there has been sentiment from industry investors that have stated the Standards are too stringent while those from the NGO world have mentioned that they do not go far enough. It would appear that there still might be debate as to how well the Standards address the wider stakeholder needs. *Assessment: Clarity Level – High*

Transaction Costs

In order to comprehensively and accurately appraise infrastructure investments against the IFC Performance Standards, there are certain transaction costs involved. For investors that are obligated by the Equator Principles, there is an annual fee on top of the reporting requirements of their organization and investments. For other investors that are not obligated to report, but choose to utilize the Performance Standards in their due-diligence process for investments, they will have transaction costs that vary based on how stringent they are in adhering to the standards. If an investor has the systems and structure in place to accommodate for a thorough analysis of projects with the standards, the transaction costs may be lower compared with an investor that relies on external parties to use the Performance Standards to appraise their investments on their behalf. *Assessment: Transaction Cost Level – Medium but variable.*

Traction

The IFC Performance Standards, through the Equator Principles and World Bank EHS guidelines have become the most widely used sustainability standards adopted by the financial industry. The adoption has grown from the strict requirements for investments made by the IFC, predominantly in developing countries but have now been used by infrastructure investors for investments made around the world. The high adoption rate for the IFC performance standards can be attributed to the long history of infrastructure investing by the IFC and World Bank and the subsequent early development of the sustainability standards specific to infrastructure. The standards have thus provided a default option and example for other infrastructure investors, as they embark on the path towards sustainability. *Assessment: Traction Level – High*

GRESB

Type: Portfolio Assessment/Project Screening Tool

Overview

GRESB Infrastructure is a portfolio-level assessment tool for asset owners like pension or superannuation funds and fund managers. It includes sub-sectors of energy generation and distribution, telecommunications, transportation, water and social infrastructure. It incorporates a wide range of performance indicators and is compatible with asset assessments like Envision, ISCA and BREEAM Infrastructure assessments.

GRESB assessments are conducted annually. Individual investments are grouped into peer groups based on the type of asset, and then scored relative to their practices and environmental performance within that group. The assessment is completed across approximately 40 indicators for each asset. GRESB indicators and metrics are developed with input from the GRESB Advisory Board and Technical Working Groups, which are comprised of institutional investors and fund managers in infrastructure.

Maintaining an infrastructure portfolio in GRESB thus enables investors to compare the environmental performance of their assets with averages by sector, and it also allows institutional investors to potentially implement portfolio-wide comparisons between fund managers.

How Investors Use GRESB

Using a portal, GRESB members answer questions about each of their investments to complete their profile, with increasing scores if the member can provide evidence of conducting certain ESG practices or justifying environmental performance. A tailored questionnaire allows investors to input data based on the type and sector of the investment. Data collected includes environmental and social metrics but also general performance metrics such as vehicle miles travelled for roads, container volumes for ports and passenger and/or flight volumes for airports. The framework is flexible to allow for the input of multiple sets of data for more complex operating investments like ports or airports. High level physical descriptions of assets are also collected, such as the size of public building or school investments and the length of roads, power lines or pipelines.

GRESB further collects performance indicator data from investors for each of their individual assets. For each performance indicator, the GRESB portal requests historical performance as well as target performance for future years, in addition to a justification should the entity not collect or report data on a given performance indicator. Table 4 includes the GRESB performance indicators used in their 2016 assessment.

Table 4: GRESB Asset Performance Indicators (2016)

1. Quality of Life
2. Health and Safety Performance <ul style="list-style-type: none">a. Fatalitiesb. Reportable Injuries
3. Total Energy Generated <ul style="list-style-type: none">a. Generatedb. Purchased
4. Greenhouse Gas Emissions <ul style="list-style-type: none">a. Generated<ul style="list-style-type: none">i. Scope 1ii. Scope 2b. Avoided<ul style="list-style-type: none">i. Scope 1ii. Scope 2
5. Air Pollutant Emissions <ul style="list-style-type: none">a. Generated (by type)b. Avoided (by type)
6. Water Use <ul style="list-style-type: none">a. Withdrawals (by type)b. Consumptionc. Discharged (by type)
7. Waste Generation and Disposal <ul style="list-style-type: none">a. Generation<ul style="list-style-type: none">i. Hazardousii. Non-hazardousb. Disposal<ul style="list-style-type: none">i. Recyclingii. Incinerationiii. Landfill
8. Biodiversity and Habitat <ul style="list-style-type: none">a. Wildlife<ul style="list-style-type: none">i. Fatalitiesii. Threatened and Endangered Fatalitiesb. Habitat Management<ul style="list-style-type: none">i. Removedii. Enhanced or Restorediii. Protected (on-site)iv. Conserved (off-site)

In addition to collecting performance indicator data on assets, GRESB collects data on the management practices of individual assets that relate to ESG factors. These include general management practices, disclosure practices, risk management, program implementation and monitoring, and stakeholder engagement. While not directly related to environmental performance indicators, these components of the portal enable GRESB scores to reflect ESG practices, such as whether the entity has a sustainability lead executive, whether it publishes a sustainability report or incorporates sustainability metrics in its other reporting, or whether it has third-party reviews of its ESG reporting or data. These management practice indicators are combined with the environmental performance indicators to develop the complete GRESB asset assessment, shown in Figure 4.

Figure 4: GRESB Assessment Methodology (Source: GRESB, 2016)



At the portfolio level, the GRESB portal collects management and reporting data that is also incorporated into fund-level reporting and scorecards. This includes a smaller set of questions on fund management practices related to ESG performance. The fund-level management questions include topics such as the presence of a formal ESG policy, the incorporation of sustainability risks into investment processes and whether or not the fund has a sustainability lead executive. Other management practices included in fund scoring are similar to those collected on individual assets, such as the presence of regular third-party reviews of ESG performance and the publication of fund-level ESG reports.

GRESB Scoring Methodology

GRESB scoring and reporting enables participants to conduct multiple comparisons at the portfolio, fund and asset level. All assets and funds receive both an annual scorecard and a benchmark report. This enables funds to compare scoring with industry averages and, for individual assets, to compare their asset performance against average performance across assets within the same sector. For asset manager scorecards, GRESB includes the functionality for institutional investors to request access to the scorecards from their service providers so they can compare performance across managers.

To develop asset and portfolio scorecards and benchmarks, the management practices and sustainability performance indicators surveyed by GRESB are scored using different methodology, then combined with fund-level manage practices to develop an aggregate score for each fund. For fund-level scores, fund management practices are weighted at 30% of the total fund score, with the remaining 70% of the fund score driven by the weighted average asset scores from individual asset assessments.

Management practice indicator scores are developed for each management practice based on three factors: 1) whether the asset conducts the practice, 2) the volume of criteria included in the management practice, and 3) whether or not the manager provided evidence or documentation that they do in fact incorporate the management practice in question.

Performance against performance indicators are developed based on a different three factors. First, GRESB bases scores on the coverage provided for the performance indicator, such as the years of data provided or the number of metrics tracked for that performance indicator. Second, GRESB bases scores on the trends for those performance indicators, or the degree to which they are improving over time. Finally, GRESB incorporates intensity into the performance indicator score. This is intended to measure the trend in the ratio of the main beneficial output (economic or physical) for the asset to the environmental performance indicator in question. In other words, the intensity factor measures the rate at which environmental performance indicators are improving relative to the asset's general operations.

These performance indicator scores are combined with the seven management practice scores to develop the total GRESB asset score, with the following weighting:

- Management: 10.7%
- Policy and Disclosure: 10.7%
- Risks and Opportunities: 10.7%
- Implementation: 10.7%
- Monitoring and EMS: 10.7%
- Stakeholder Engagement: 10.7%
- Certifications and Awards: 10.7%
- Performance Indicators: 25%

Assessment of GRESB as an Infrastructure Sustainability Standard

Comprehensiveness

The infrastructure sector is extremely idiosyncratic relative to other real assets sectors like real estate, so the development of a comprehensive portfolio assessment tool that can compare across nuanced assets and sectors is extremely difficult. Still, GRESB has the flexibility to incorporate a wide range of asset types already and further flexibility in the specific metrics used for each.

GRESB infrastructure is further comprehensive in its high level of focus on management practices and policies in addition to fundamental environmental performance indicators. These management practices significantly drive asset and fund scoring under GRESB. The assessment is thus designed to not only assess fundamental environmental performance but also to give investors a roadmap towards better performance in sustainability monitoring and management. As use of the assessment tool increases GRESB will likely evolve its metric system to incorporate additional asset types and performance indicators.

The only area in which GRESB is limited in scope, at least relative to global infrastructure assets, is partially by design in their focus on infrastructure investors and asset managers. Should GRESB evolve to incorporate assets that are managed by public agencies and governments in the future, it will expand to a much broader set of asset owners. *Assessment: Expanding in terms of sectors and performance indicators.*

Objectivity

GRESB scores are largely developed via self-assessment, which incorporates an element of subjectivity. To combat this, GRESB incorporates the provision of evidence and documentation into its scoring methodology, giving members an incentive to provide evidence of every management practice and performance indicator included in the study. GRESB uses this documentation for automated and manual verification processes in reviewing its resulting scores. This, though, results in a different element of subjectivity in aggregate scores at least in comparing environmental performance indicators. An asset or portfolio that performs better in terms of actual environmental performance indicators than a peer could receive a aggregate score under GRESB if the peer scores better in terms of documentation and reporting or other management practices. This is not necessarily a bad outcome, as part of GRESB's purpose is to incentivize sound sustainability management, risk assessment and reporting in addition to furthering fundamental environmental performance indicators.

GRESB also maintains a validation team to check participant self-assessments. Using random selection based on past assessments and submission data, the validation team completes validation interviews on approximately 5% of participants and also completes validation site visits for a very small percentage of the assets or participants in the system. *Assessment: Self-assessment necessitates some subjectivity, which is managed via evidence collection and spot-check validation.*

Clarity

GRESB provides ample documentation detailing their scoring methodology and the calculations used to roll up management practice scores and environmental performance indicators to determine asset scores and eventually aggregate them for fund scores. Still the complexity of that analysis means a wide range of factors can drive aggregated scores over time. GRESB addresses this with summary reports and report cards for funds and assets that compare performance on specific metrics over time and across different criteria. This enables members to assess where various funds and assets are performing well and where additional work is needed, which helps guide clients and managers towards practice areas that can be improved upon. *Assessment: Loses some clarity in aggregating scoring data but provides very analytical tools for detailed performance reviews for participants.*

Transaction Costs

GRESB is funded by annual membership fees from institutional investors, asset managers, and partners, which are commonly environmental services industry firms. Fees for fund managers are based on the number of funds and total AUM. The only other transaction costs associated with GRESB are any resources required by members to actually complete the assessments. This would be mostly limited to staff time for a basic assessment. Other costs to document or measure progress or to implement management practices that improve GRESB scores are directly related to improving the fund and asset sustainability performance that GRESB measures. *Assessment: Transaction costs of implementation are limited.*

Traction

The first GRESB Infrastructure assessment was completed in 2016, so the assessment is relatively new, but it already has considerable traction within the infrastructure investment industry. Last year, 64 fund or investor members completed assessments which included 160 infrastructure assets in 24 countries. Assets included in the assessment were somewhat concentrated in Europe and the UK with many assets in the U.S. and Australia also included.

GRESB's assessment program for the real estate industry has a longer track record than its infrastructure assessment, and considerably higher traction. In 2017, more than 850 property companies and real estate funds, representing more than \$3.7 trillion under management, completed the GRESB real estate assessment. It is likely that GRESB will continue to develop its infrastructure assessment practice in a similar manner. *Assessment: To new to accurately assess traction, but significant first year growth and a track record in other sectors.*

Sustainability Accounting Standards Board Infrastructure Team (SASB)

Type: Accounting Tool

Overview

The Sustainability Accounting Standards Board (SASB) is a registered non-profit organization in the United States established in 2011 to develop industry specific accounting standards for sustainability issues. SASB has developed specific standards for 88 industries in 10 sectors to be integrated into standard reporting filings. Infrastructure is included as a specific sector while there are also specific sectors for transportation, health care, renewable resources and alternative energy. The standards describe impacts and opportunities for innovation, and characterize a company's positioning with respect to sustainability issues. The SASB has been developed in the United States but the standards can be used around the world. The purpose of SASB is to provide corporations with a way to manage and disclose on sustainability issues, which enables investors to have the relevant information for decision-making that they can use to benchmark corporate performance on sustainability issues.

SASB is premised by the fact that sustainability disclosures are governed by the same laws and regulations that govern disclosures by securities issuers generally. According to the U.S. Supreme Court, a fact is material if, in the event such fact is omitted from a particular disclosure, there is "a substantial likelihood that the disclosure of the omitted fact would have been viewed by the reasonable investor as having significantly altered the 'total mix' of the information made available." SASB has attempted to identify the sustainability topics that it believes may be material for all companies. SASB recognizes, however, that each company is ultimately responsible for determining what is material to it.

The SASB is based on the Sustainable Industry Classification System (SICS) to categorize industries according to their resource intensity and sustainability innovation potential. A materiality map is used to understand the relative materiality of issues per industry. The materiality map consists of three steps: evidence of interest, evidence of economic impact, forward looking adjustment. The material issues are ranked and a threshold for material sustainability is determined for each industry. Industry research on key environmental, social and governance issues includes the identification of existing metrics and practices used to quantify and articulate each material issue. SASB then selects the KPIs that are most effective from the existing population or they create new ones, resulting in an outline of proposed KPIs for the industry. Industry working groups (made up of members who are market participants, corporations, public interest and intermediaries) are then formed to review the sustainability accounting standard which is incorporated before publishing the performance indicators and inviting public comment over 30 days. After incorporating the public comments into the standard, the SASB Standards Council review each standard for consistency, completeness, accuracy and compliance with the standards setting process outlined by the American National Standards Institute. The SASB standards council is comprised of experts in development of standards, accounting and securities and environmental law.

Applying/Using the SASB Standards

The SASB standards are comprised of disclosure guidance and accounting standards on sustainability topics for use by companies in their annual filings with regulatory authorities such as the Securities and Exchange Commission (SEC). The disclosure guidance identifies sustainability topics which may be material to a company's specific operating context. The accounting standards provide companies with standardized accounting metrics to account for performance on industry-level sustainability topics.

For each of the industry standards, SASB recommends that a registrant disclose any basic business data that may assist in the accurate evaluation and comparability of disclosure, to the extent that they are not already disclosed. This data in the standards is called 'activity metrics', and can include high-level business data such as total number of employees, quantity of products produced or services provided, number of facilities, or number of customers. It may also include industry-specific data such as plant capacity utilization (e.g., for specialty chemical companies), number of transactions (e.g., for Internet media and services companies), hospital bed days (e.g., for health care delivery companies), or proven and probable reserves (e.g., for oil and gas exploration and production companies).

An example of activity metrics for the road transportation category is shown below:

Activity Metric	Category	Unit of Measure	Code
Revenue ton miles ⁷	Quantitative	Ton-miles	TRO402-A
Load factor ⁸	Quantitative	n/a	TRO402-B
Number of employees, number of truck drivers	Quantitative	Number	TRO402-C

Furthermore, an example of the specific sustainability disclosure topics and accounting metrics is shown below for the road transportation group:

Topic	Accounting Metric	Category	Unit of Measure	Code
Environmental Footprint of Fuel Use	Gross global Scope 1 emissions	Quantitative	Metric tons CO ₂ -e	TRO402-01
	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	TRO402-02
	Total fuel consumed, percentage renewable	Quantitative	Gigajoules, Percentage (%)	TRO402-03
	Air emissions for the following pollutants: NO _x , SO _x , and particulate matter (PM)	Quantitative	Metric tons (t)	TRO402-04
Driver Working Conditions	Employee turnover by (1) voluntary and (2) involuntary for all employees	Quantitative	Rate	TRO402-05
	Description of approach to managing short-term and long-term driver health risks	Discussion and Analysis	n/a	TRO402-06
Accidents and Safety Management	Number of accidents and incidents	Quantitative	Number	TRO402-07
	(1) Total recordable injury rate and (2) fatality rate for (a) full-time employees and (b) contract employees	Quantitative	Rate	TRO402-08
	Safety Measurement System BASIC percentiles for: (1) Unsafe Driving, (2) Hours-of-Service Compliance, (3) Driver Fitness, (4) Controlled Substances/Alcohol, (5) Vehicle Maintenance, and (6) Hazardous Materials Compliance	Quantitative	Percentile (%)	TRO402-09
	Number and aggregate volume of spills and releases to the environment	Quantitative	Number, Cubic meters (m ³)	TRO402-10

The accounting metrics for the SASB sustainability disclosures draw upon technical guidelines such as the Kyoto Protocol, World Business Council for Sustainable Development, IPCC, DOE, the US Energy Information Administration.

Investors are able to use SASB tools to analyze and access the material sustainability information on companies in their portfolio as well as prospective investee companies. The resources available to investors include engagement guides, ESG integration insights, a climate risk bulletin and a Materiality Map which provides investors with a visual representation of their portfolio's exposure to specific sustainability risks. All of these resources are provided on a user pays basis.

Assessment of SASB Standards

Comprehensiveness

The comprehensiveness of the SASB standards is restricted by the definitions and guidelines for reporting materiality in regulatory reports. SASB would score highly in the breadth aspect of comprehensiveness, given that the standards are designed to be used for all companies in the economy that submit filings to the national regulatory body. The general usability of the standards is thus strong. The breadth of coverage of the standards may result in a lack of depth for infrastructure specifically. SASB has been developed within the United States context and despite the organization proposing the use of the standards in other jurisdictions, it is likely that the SASB standards will be applied in the US initially. Because of the generic nature of the standards, there is no specific differentiation made for the lifecycle of a project. The same standards are applied for all companies within a sector and so this may mean that elements of new projects (which are very different) to existing assets, might be missed.

Assessment: Comprehensiveness Level - Medium

Objectivity

The SASB standards involve self-reporting by the companies on their material sustainability issues. Despite the standards following the format and definitions of regulating bodies such as the SEC, the self-reporting aspect means that a certain level of subjectivity would be involved in the reports created. The guidelines are designed to be applied to companies within a sector or industry and so there is an element of standardization, given the organization is providing the same information (for example through the materiality map) to be applied across the board. *Assessment: Objectivity level - Medium*

Clarity

The SASB standards can be applied to all companies within an investor's portfolio. SASB has developed tools that enable investors to measure their exposures across a portfolio. The guidelines suggested by SASB are transparent in nature and can be applied across a portfolio, however, the effectiveness and aggregation of the data would be dependent on the accuracy of the information recorded by the company itself. Because the standards are voluntary, it would be likely that those partaking in the reporting would be doing so because they believe in the material nature of sustainability for their company and so the likelihood of misreporting may be small. As discussed above, the standardized nature of the reporting guidelines might compromise the depth of analysis involved in the standards. *Assessment: Clarity level: High*

Transaction Costs

In order to obtain the guidelines from SASB, a company must pay a fee to get access to the full reports and information required to report on their sustainability. It is likely that a company that does not have much expertise in sustainability or ESG will require the services of an external consultant or auditor to fill their reports out for them, incurring further costs. These external costs may subside in the future however because of the standardized nature of the reporting, and the ability to incorporate this into normal reporting procedures swiftly. Investors would need to pay to be able to access the aggregated information from SASB and to access the tools offered to analyze the companies in their portfolio. *Assessment: Transaction Costs Level - Medium - High*

Traction

The SASB standards have only been in effect since 2012 and so is at an early stage of its development. Traction is thus low amongst infrastructure investors at this time. The standards are targeted at all sectors of the economy and so it is likely that the adoption for infrastructure will increase as its general use increases. The transaction costs involved however may be a barrier to the wider use of the standard and related tools in the initial term.

Assessment: Traction - Low

Task Force on Climate-Related Financial Disclosures

Type: Accounting Tool

Overview

The FSB Task Force on Climate-related Financial Disclosures (TCFD) is a task force set up by the Financial Stability Board to develop voluntary, consistent climate related financial risk disclosures and provide information to investors, lenders, insurers and other stakeholders. The purpose of the TCFD is to develop recommended disclosures for companies that would be useful for understanding material climate risks. The TCFD is made up of 32 members from around the world which come from large banks, insurance companies, asset managers, pension funds, large non-financial companies, accounting and consulting firms, and credit agencies. In developing its recommendations, the TCFD drew on member expertise, stakeholder engagement, and existing climate-related disclosure regimes to develop a singular, accessible framework for climate-related financial disclosure.

The key features of the TCFD recommendations are that they are intended to be adopted by all organizations, included in financial filings, designed to solicit decision-useful, forward-looking information on financial impacts, and have a strong focus on risks and opportunities related to a transition to lower-carbon economy. There is a particular focus on the role of asset owners and asset managers, due to the recognition, that these institutions sit at the top of the investment value chain and, therefore have an important role to play in influencing the organizations in which they invest to provide better climate-related financial disclosures.

The recommendations are structured around four thematic areas that represent core elements of how organizations operate: governance, strategy, risk management, and metrics and targets. A key recommendation of the TCFD is that climate-related issues are or could be material and so companies should include this in their mainstream annual financial filings (given those that have public debt or equity have a legal obligation to disclose material information in their financial filings). Additionally, one of the TCFD's key recommended disclosures focuses on the resilience of an organization's strategy, taking into consideration different climate-related scenarios, including a 2 degrees Celsius or lower scenario.

Implementing the TCFD Recommendations

The TCFD recommendations are specifically intended for all financial and non-financial organizations with public debt or equity but all organizations across all sectors are also encouraged to implement the recommendations. Part of the final report by the TCFD exercise has been the development of seven principles for effective disclosure, to help guide climate-related financial reporting. These principles include:

- Disclosures should present relevant information
- Disclosures should be specific and complete
- Disclosures should be clear, balanced and understandable
- Disclosures should be consistent over time
- Disclosures should be comparable among organizations within a sector, industry or portfolio
- Disclosures should be reliable, verifiable and objective
- Disclosures should be provided on a timely basis

The disclosures related to the Strategy and Metrics and Targets recommendations involve an assessment of materiality. It is recommended for asset owners and asset managers to also include carbon foot-printing in reports to clients and beneficiaries. Common carbon foot-printing and exposure calculations, formulas and additional information are provided in the recommendations. The TCFD provide recommendations on the key metrics that should be used to measure and manage climate-related risks and opportunities specifically those associated with water, energy, land use, and waste management where relevant and applicable.

Recommendations are provided specifically for financial institutions such as asset owners and asset managers and for non-financial groups such as the energy, transportation, materials and buildings and agriculture, food and forest products groups. The non-financial groups represent sectors where climate change will have a greater impact than other industries.

An illustrative example of the TCFD metrics recommended for the Energy Group is provided below:

Figure 5: TCFD Recommendations - Energy Group Metrics

Energy Group Metrics - Illustrative Examples

Energy Group organizations should consider providing key GHG emissions, energy, water, land use, and low-carbon alternative metrics on the financial aspects related to revenue, costs, assets, liabilities, and capital allocation.

Appendix 2 includes definitions of the abbreviations used in "Unit of Measure."

Financial Category	Climate-Related Category	Example Metric	Unit of Measure	Alignment	Rationale for Inclusion	Oil and Gas	Coal	Electric Utilities
Revenues	GHG Emissions	Estimated Scope 3 emissions, including methodologies and emission factors used	MT of CO ₂ e	GRI: 305-3 CDP: EU4.3	(Relatively) high carbon emissions in the value chain may accelerate development of alternative technologies in a low-carbon economy. The level of emissions informs vulnerability to a significant decrease in future earnings capacity.	■	■	■
Revenues	Risk Adaptation and Mitigation	Revenues/savings from investments in low-carbon alternatives (e.g., R&D, equipment, products or services)	Local currency	CDP: CC3.2, 3.3, CC6.1 SASB: NRO103-14	New products and revenue streams from climate-related products and services and the return on investments of CapEx projects that create operational efficiencies.	■	■	■
Expenditures	GHG Emissions	Describe current carbon price or range of prices used	Local currency	CDP: CC2.2 SASB: NRO101-22, NRO201-16	Internal carbon prices used, affecting the assessment of an organization's key assets, provide investors with a proper understanding of the reasonableness of assumptions made as input for their risk assessment.	■	■	■
Expenditures	Risk Adaptation and Mitigation	Expenditures (OpEx) for low-carbon alternatives (e.g., R&D, equipment, products or services)	Local currency	GRI: G4-OG2 CDP: EU4.3	Expenditures for new technologies are needed to manage transition risk. The level of expenditures provides an indication of the level to which future earning capacity of core business might be affected.	■	■	■
Expenditures	Risk Adaptation and Mitigation	Proportion of capital allocation to long-lived assets versus short-term assets	Percentage	N/A	Impacts of climate change are subject to uncertainty in terms of extent and timing. Understanding the allocation to long- versus short-lived assets informs the potential of an organization to adapt to emerging climate-related risks and opportunities.	■	■	■
Expenditures	Water	Percent water withdrawn in regions with high or extremely high baseline water stress	Percentage	SASB: IF0101-06	Water stress can result in increased cost of supply, impacts to operations, and increased regulation/reduced access to water withdrawal. The percent withdrawn in high water-stress areas informs the risk of significant costs or limitations to production capacity.	■	■	■
Expenditures	GHG Emissions	Amount of gross global Scope 1 emissions from: (1) combustion, (2) flared hydrocarbons, (3) process emissions, (4) directly vented releases, and (5) fugitive emissions/leaks	MT of CO ₂ e	SASB: NRO101-01	Relatively significant Scope 1 emissions are expected to drive regulations (including carbon prices) that require lower emissions from products. This can result in a significant decrease in future earning capacity.	■		

The recommendations provide guidance on the category of metric, the type of climate risk, an example of the metric, unit of measure and rationale. Alignment of each metric to other disclosure methodologies such as the Global Reporting Initiative (GRI), and Sustainability Accounting Standards Board (SASB) is also provided. Similar disclosure recommendations are provided for the other groups of companies identified above.

Assessment of TCFD as an Infrastructure Sustainability Standard

Comprehensiveness

Having been established out of the financial sector, the TCFD is applicable to the full portfolio of assets for an investor and provides enough detail that could be applied to most companies in the infrastructure sector. The recommendations are tailored to companies as opposed to projects and so details of specific projects may be lost in the reporting when aggregated at the company level. The specific environmental outcomes seem to be well covered by the TCFD recommendations with coverage of carbon foot-printing, GHG emissions, and scenario analyses as well as alignment with other major climate methodologies where required. *Assessment: Medium to high comprehensiveness. Considerable breadth of sectors covered although depth of project level details may be lost when aggregated into company level annual reports.*

Objectivity

The TCFD has been developed in conjunction with key reporting agencies and accounting consultancies in order to make the assessments as consistent and objective as possible. The TCFD reporting standards are to be incorporated with standard company annual reports and will likely be reviewed by the Chief Financial Officer and audit committee. There will still be an element of self-reporting involved with the standards, however the standardized nature should provide robustness. *Assessment: Objectivity level medium-high – Consistent reporting framework (in line with annual reports) although self-reporting required.*

Clarity

As highlighted above, the TCFD reporting standards are to be in line with standard financial annual reporting. The clarity of these standards would thus score highly. The framework enables the metrics to be scaled and used for portfolio-level reporting and provide the sufficient clarity to be utilized on a regular basis without being restricted by specific projects. There is significant effort to bring the standards in line with scientific based scenarios such as the 2 degree Celsius above pre-industrial levels scenario (IPCC). *Assessment: Clarity level – very high*

Transaction Costs

In order to apply the TCFD reporting standards comprehensively across an infrastructure portfolio, significant resources would be required. Resources would be required so that the relevant metrics are being recorded for each of the assets on a regular basis. Further resources are required to appraise companies and projects on the specified metrics. Additional resources would then be required to audit the measurements for annual reporting. This would require dedicated resources in-house to be able to track the information, as well as dedicated time from existing personnel such as financial officers and members of the audit committee. *Assessment: Transaction costs – high. Dedicated team resources would be required to track the information and dedicated time from existing personnel to report and audit the information.*

Traction

The TCFD was formulated in 2015 and so the adoption of the standards is at its early stages of development. The disclosures are intended to be voluntary in nature but should help companies understand what financial markets want from disclosure in order to measure and respond to climate change risks and encourage firms to align their disclosures with investors' needs. The TCFD is tailored towards the largest investor organizations in the world, with the idea that these organizations will have the potential to have the greatest impact. *Traction: Just started but likely to grow as adoption by investors increases and information (and intent) is communicated to portfolio companies.*

ISCA

Type: Project Screening Tool

Overview

The Infrastructure Sustainability Council of Australia (ISCA) provides a project rating scheme for infrastructure projects in addition to providing training and advisory work for projects. ISCA operates in Australia and New Zealand and since its founding in 2007 the organization has grown to over 100 affiliate members and the rating system has been used for over \$80bn in infrastructure projects. In 2017, ISCA launched an international rating system that can be applied to projects outside of Australia. ISCA developed its rating program in close collaboration with Australian public agencies and political leaders at the state and national level in Australia. Between 2012 and 2013 it was launched as a sustainability assessment tool by the national government and all of the state governments there.

The IS rating system is designed to be applied across sectors in infrastructure, including transport, energy, waste disposal, water and wastewater and telecommunications. IS also offers different ratings based on the stage of the project – planning, design, as-built and in operation. ISCA also publishes the project ratings for every project it certifies, though not the detailed assessment as this may contain proprietary information.

ISCA has received significant support from public agencies in Australia in sustainability mandates for projects. Many transport agencies in Australia, for instance, now mandate ISCA ratings for projects with a total cost of more than \$50mm.

How Investors Use ISCA

Companies or investors completing an ISCA assessment must appoint a lead individual for the assessment that is an Infrastructure Sustainability Accredited Professional (ISAP) and is thus certified by ISCA to complete the assessment process. Once a project is registered in the ISCA system, the lead individual from the project company works with a case manager at ISCA to develop the assessment, and this is the bulk of the total process. Each project then must undergo a 3-month verification process with a 3rd party reviewer, before receiving its final certification from ISCA. ISCA assessments cover a wide range of sustainability aspects, including those listed in Table 5.

Table 5: ISCA Assessment Sustainability Categories and Codes (ISCA, 2018)

1. Governance
a. Con - Context
b. Lea - Leadership and Management
c. Spr - Sustainable Procurement
d. Res - Resilience
e. Inn - Innovation
2. Economic
a. Ecn - Options Assessment and Business Case
b. Ecn - Benefits
3. Environment
a. Ene - Energy and Carbon
b. Gre - Green Infrastructure
c. Env - Environmental Impacts
d. Res - Resource Efficiency
e. Wat - Water Resources
f. Eco - Ecology
4. Social
a. Sta - Stakeholder Engagement
b. Leg - Legacy
c. Her - Heritage
d. Wfs - Workforce Sustainability

The categories included in the table above each have one or more evaluation criteria. Some materiality is determined by the stage at which the project is rated. Different evaluation criteria are used depending on whether the project is applying for a planning, design, as-built or operations rating.

Additional materiality is determined at the outset of an evaluation, which includes an initial sustainability plan and an assessment of the materiality of the various categories for the project. Materiality assessments in ISCA can be based on the Global Reporting Initiative (GRI), in which ratings are applied to the different categories in Table 5 on their impacts and importance to stakeholders involved in the project, or they can be based on the UN SDGs, in which the project team estimates the relevance of the project to various SDGs and this is translated to the ISCA ratings categories. Materiality assessments in ISCA are required to be completed in consultation with all project stakeholders, and the assessments may determine whether particular evaluation criteria are scoped out of an assessment and also the relevant importance of each of the criteria. The total point scores available for each criteria are re-weighted following the materiality assessment to determine their impacts on the total project score.

The process for completing an ISCA assessment is very involved, with assessors and case managers using an excel workbook to document responses, evidence and rulings for each of the evaluation criteria. This is combined with the materiality assessment to aggregate scores under each category and for the project as a whole. The completed workbook and required documentation are then submitted and used for the verification process.

ISCA Scoring Methodology

ISCA uses an adjusted point system to determine overall project scores. Projects may receive a total of 100 points plus an additional 10 points for under the evaluation criteria for innovation, which awards some additional points for truly innovative approaches to addressing sustainability issues for projects. The relative weightings of the different categories (of the 100 points possible) is determined by the materiality assessment. Under version 2 of the ISCA rating system, a project level rating of Bronze, Silver, Gold, Platinum or Diamond are awarded to projects that achieve a point total of 20, 40, 60, 80, or 95, respectively.

The individual point scores for the criteria in ISCA are determined by achievement levels, which are defined in assessment manuals. Criteria have a maximum of three different achievement levels. If the requirements for them are met for that criteria they would effectively award that percentage of the total points possible to the project. If there were three achievement levels each one would thus award one third of the possible points. Some of the criteria also include environmental or other performance metrics that award a pro-rata portion of the points possible. For example, the Ene-1 evaluation criteria for "Energy and Carbon Reduction" has two performance levels. The first performance level awards half of the possible points for that criteria, and is achieved if a carbon monitoring program is in place and the project is able to demonstrate that carbon and energy reduction opportunities were identified during the project design phase and were implemented. The second performance level awards the remainder of the points possible and is achieved if the project monitoring program demonstrates a percentage reduction beyond a base footprint. All of the remaining points are awarded for a 30% reduction, with a pro-rata point allocation for percentages below a 30% reduction.

Each evaluation criteria is supplemented with additional data in order to achieve a point award determined by performance levels. This includes a written justification for the achievement of the performance levels, a series of "must statements" that must be met for the project to receive any points under the criteria, a list of any rulings from ISCA or other bodies that certify that the criteria was met, a table of evidence references that supports the achievement of the performance level stated, assessor feedback and requirements before a point award is certified under that criteria, and a cost-benefit analysis of achieving the stated performance level for that criteria.

Assessment of ISCA as an Infrastructure Sustainability Standard

Comprehensiveness

ISCA has the most comprehensive assessment process, in terms of the amount of work required by applicants to verify performance and complete the rating, of any of the project screening tools included in this study. The environmental and social categories included in the assessment are further comprehensive, and, like some of the other project screening tools included in this study, ISCA's flexibility to assess projects at different stages of the project lifecycle increases the potential set of projects that could use the system. ISCA optimizes to ensure projects undergo a rigorous verification process and document the achievement of sustainability performance and the implementation of management practices. ISCA's geographical footprint has to date been limited to Australia and New Zealand, but the recent development of an international standard could enable the system to expand to other regulatory regimes in the future. *Assessment: Extremely comprehensive and rigorous assessment process. Currently limited geographically, but expanding.*

Objectivity

The objectivity of an ISCA assessment is limited by the relatively high weighting of materiality in each assessment, and the inclusion of many management or policy criteria in its evaluation of each category, including a list of “must statements” which are required for any score in each category, above and beyond each achievement level. Many of the evaluation categories also include both management practices and some form of environmental performance indicator (usually improved performance relative to a baseline) which requires some degree of subjective evaluation in those categories. The reliance on some of these more subjective factors may be part of the reason ISCA has a very robust review and evaluation process, and ISCA further balances these criteria by providing very detailed guidance and including 3rd party verification in each assessment. *Assessment: Some subjectivity due to combined management practice and performance indicator category scores, and importance of materiality in assessments, which is counterbalanced by very robust and objective review process and detailed score and evidence guidance.*

Clarity

ISCA's robust feedback and certification process means that project sponsors will get very clear and detailed information on how their score was generated and the specific tasks that would be required to improve each individual criteria. Like other project screening criteria, the inclusion of management practices in a large number of credit scores leads to some reduced clarity in terms of what drives individual credit scores and thus the overarching project scores. For ISCA, this is counterbalanced by an extremely robust certification process with multiple layers of review, and verification, and detailed evidence required for each management practice included. At the project assessment level, ISCA provides additional detailed metrics to give users a more detailed picture of environmental performance beyond a total score or award level, including spider-chart graphs that clearly illustrate performance across each of the evaluation categories. *Assessment: Very clear feedback process for applicants, well documented materiality assessments and evaluations. Inclusion of management practices limits performance clarity in aggregate project scores to some extent.*

Transaction Costs

ISCA assessment fees are broken down by fees to register the project in the system, fees for support in the assessment process, and a fee for verification and rating. Fees are based in part on the size of the project in terms of total capital costs and in part on whether it is a planning assessment or an as-built assessment of a completed project. ISCA also sells memberships to companies and investors in the infrastructure sector for reduced fees per assessment. For non-members, the total fees of an ISCA assessment range from approximately \$30,000 for a small project to approximately \$75,000 for a project with a total cost of more than \$500mm. Projects with a total cost of more than \$1bn have negotiated fees. *Assessment: Assessment fees are high relative to the other project screening assessments included in this study, though still small as a percentage of total project costs. The process of completing an ISCA assessment is very involved and robust compared to other project screening tools.*

Traction

ISCA has achieved significant traction in Australia and New Zealand. Its website includes a growing list of more than 36 projects that had achieved certified ratings, with many others likely in development and with ratings to be completed once the projects are complete and operation. The support provided to ISCA from public sponsors and procurement agencies in Australia and New Zealand, in mandating the sustainability metric for the projects they procure over a minimum baseline cost, is likely an important driver of ISCA's success. The recently developed ISCA international assessment does not have any reported project ratings to date, but is very recent and may be adopted internationally in the future. *Assessment: Very strong traction limited to Australia and New Zealand.*

Greenhouse Gas (GHG) Protocol Accounting and Reporting Standard

Type: Accounting Tool

Overview

The GHG Protocol is a multi-stakeholder partnership of businesses, non-governmental organizations (NGOs), governments, and others convened by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). The GHG Protocol was launched in 1998 to develop internationally accepted greenhouse gas (GHG) accounting and reporting standards and tools, to promote their adoption in order to achieve a low emissions economy.

The GHG Protocol standards have been developed in conjunction with businesses, government agencies, non-governmental organizations, and academic institutions from around the world. The standards include detailed guidance to assist users with their implementation. There are seven different types of standards, protocols and guidelines that have been developed by the GHG Protocol. These include the following:

- GHG Protocol Corporate Accounting and Reporting Standard (2004)
- GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard (2011):
- GHG Protocol for Project Accounting (2005):
- GHG Protocol for the U.S. Public Sector (2010):
- GHG Protocol Guidelines for Quantifying GHG Reductions from Grid-Connected Electricity Projects (2007):
- GHG Protocol Land Use, Land-Use Change, and Forestry Guidance for GHG Project Accounting (2006):
- Measuring to Manage: A Guide to Designing GHG Accounting and Reporting Programs (2007):
- GHG Protocol for Project Accounting

The above documents have been developed to complement each other, and while they focus on specific areas or segments of the economy, in many ways they feed off each other. The GHG Protocol corporate Scope 3 Standard and GHG Protocol Product standard both take a value chain or life cycle approach to GHG accounting. The Scope 3 standard builds on the GHG Protocol Corporate standard and accounts for value chain emissions at the corporate level, while the Product Standard accounts for life cycle emissions at the individual product level. The standards help companies identify GHG reduction opportunities, track performance, and engage suppliers.

The sum of the life cycle emissions of each of a company's products, combined with additional scope 3 categories (e.g., employee commuting, business travel, and investments), should approximate the company's total corporate GHG emissions. In practice, companies are not expected or required to calculate life cycle inventories for individual products when calculating scope 3 emissions.

The GHG Protocol for Project Accounting (Project Protocol) was the culmination of a unique four-year dialogue and consultation process with business, environmental, and government experts led by the World Resources Institute (WRI) and WBCSD. The Project Protocol is aimed primarily at project developers, to quantify GHG reductions resulting from projects, but could also be used by administrators or designers of initiatives, systems, and programs that incorporate GHG projects.

The Land Use, Land-Use Change, and Forestry (LULUCF) Guidance for GHG Project Accounting (LULUCF Guidance) was developed by the World Resources Institute to supplement the Project Protocol. This document provides more specific guidance and uses more appropriate terminology and concepts to quantify and report GHG reductions from LULUCF project activities.

The Guidelines for Grid-Connected Electricity Projects provides detailed guidance on how to account for greenhouse gas emission reductions created by projects that displace or avoid power generation on electricity grids. The guidelines are designed primarily for two target audiences: project developers seeking to quantify GHG reductions outside of a particular GHG offset program or regulatory system; and designers of initiatives, systems, and programs that incorporate grid-connected GHG projects

The GHG Protocol standards have been designed to be policy neutral and have been used by many other GHG programs including:

- Voluntary GHG reduction programs such as the World Wildlife Fund (WWF) Climate Savers, the U.S. Environmental Protection Agency (EPA) Climate Leaders, the Climate Neutral Network, and the Business Leaders Initiative on Climate Change (BLICC); GHG registries such as California Climate Action Registry (CCAR), World Economic Forum Global GHG Registry;
- National and regional industry initiatives, e.g., New Zealand Business Council for Sustainable Development, Taiwan Business Council for Sustainable Development, Association des entreprises pour la réduction des gaz à effet de serre (AERES);
- GHG trading programs, e.g., UK Emissions Trading Scheme (UK ETS), Chicago Climate Exchange (CCX), and the European Union Greenhouse Gas Emissions Allowance Trading Scheme (EU ETS);
- Sector-specific protocols developed by a number of industry associations

To complement the standard and guidance provided by the documents outlined above, a number of cross-sector and sector-specific calculation tools have been produced by the GHG Protocol Initiative. These tools provide step by-step guidance and electronic worksheets to help users calculate GHG emissions from specific sources or industries, many of which are specific or adjacent to the infrastructure sectors. The tools are consistent with those proposed by the Intergovernmental Panel on Climate Change (IPCC) for compilation of emissions at the national level (IPCC, 1996). The tools have been compiled by many companies, organizations, and individual experts through an intensive review. A number of organizations have considered the tools to be 'best practice'.

GHG Accounting and Reporting Principles

As with other financial accounting and reporting, the GHG Accounting and Reporting are developed alongside generally accepted principles that are intended to underpin and guide GHG emissions accounting and reporting. The protocol has stated that GHG accounting and reporting should be based on the following principles:

Relevance: Ensure the GHG inventory appropriately reflects the GHG emissions of the company and serves the decision-making needs of users – both internal and external to the company.

Completeness: Account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusions.

Consistency: Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series.

Transparency: Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.

Accuracy: Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information.

Applying the GHG Protocol Standards

While the GHG Protocol have produced a number of different guidelines, we highlight here the process associated with the Corporate Accounting and Reporting Standard. This standard provides the basis for how many other standards and guidelines have been developed by the Protocol and can be applied generally to companies across different infrastructure sectors.

The GHG Protocol corporate accounting and reporting standard document is separated into a number of key sections to help provide organizations with guidelines for reporting their GHG emissions. It covers the accounting and reporting of the six greenhouse gases covered by the Kyoto Protocol – carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF₆).

There are eleven chapters in the GHG Protocol Corporate Accounting and Reporting document, the initial two of which cover the Principles of the standards outlined above as well as an overview of why businesses should be reporting GHG emissions. This is followed by two chapters that focus on setting the organizational and operational boundaries for the GHG reporting.

For organizational boundaries, two approaches are used – the control approach and the equity approach, for reporting the GHG emissions from the different corporate structures associated with a company. Under the equity share approach, a company accounts for GHG emissions from operations according to its share of equity in the operation. Under the control approach, a company accounts for 100 percent of the GHG emissions from operations over which it has control.

Once organizational boundaries have been set, the company then needs to set its operational boundaries for reporting GHG emissions. This involves identifying emissions associated with its operations, categorizing them as direct and indirect emissions, and choosing the scope of accounting and reporting for indirect emissions. To help delineate direct and indirect emission sources, three “scopes” (scope 1, scope 2, and scope 3) are defined for GHG accounting and reporting purposes. Scope 1 accounts for direct GHG emissions, scope 2 accounts for GHG emissions from the generation of purchased electricity consumed by the company and scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions.

Chapter 5 of the report then provides guidelines for tracking emissions over time. A meaningful and consistent comparison of emissions over time requires that companies set a performance datum with which to compare current emissions. This performance datum is referred to as the base year emissions. For consistent tracking

of emissions over time, the base year emissions may need to be recalculated as companies undergo significant structural changes such as acquisitions, divestments, and mergers.

Chapter 6 provides the specific guidelines for identifying and calculating GHG emissions which the Protocol summarize with the following steps:

1. Identify GHG emissions sources
2. Select a GHG emissions calculation approach
3. Collect activity data and choose emission factors
4. Apply calculation tools
5. Roll-up GHG emissions data to corporate level.

Detailed guidelines are provided in the document for addressing each step above. The most common approach for calculating GHG emissions is through the application of documented emission factors. These factors are calculated ratios relating GHG emissions to a proxy measure of activity at an emissions source. The IPCC guidelines (IPCC, 1996) refer to a hierarchy of calculation approaches and techniques ranging from the application of generic emission factors to direct monitoring. The GHG Protocol tools highlighted above are also used as appropriate for the calculation of GHG emissions.

The guidance in chapter seven is intended to help companies develop and implement a quality management system for their inventory. A corporate GHG inventory program includes all institutional, managerial, and technical arrangements made for the collection of data, preparation of the inventory, and implementation of steps to manage the quality of the inventory.

Chapter eight outlines the details and different issues associated with GHG reductions. The GHG Protocol Corporate Standard focuses on accounting and reporting for GHG emissions at the company or organizational level. Reductions in corporate emissions are calculated by comparing changes in the company's actual emissions inventory over time relative to a base year. Focusing on overall corporate or organizational level emissions has the advantage of helping companies manage their aggregate GHG risks and opportunities more effectively. It also helps focus resources on activities that result in the most cost effective GHG reductions.

One of the most important chapters in the GHG protocol corporate standard is that of chapter nine, which outlines how to produce a credible GHG emissions report that presents all relevant information. The standard highlights the required information that a public emissions report should contain such as: an outline of the organizational boundaries chosen, including the chosen consolidation approach; an outline of the operational boundaries chosen, and if scope 3 is included, a list specifying which types of activities are covered; the reporting period covered. The information that should be included in the report should consist of the following:

- Total scope 1 and 2 emissions independent of any GHG trades such as sales, purchases, transfers, or banking of allowances
- Emissions data separately for each scope
- Emissions data for all six GHGs separately (CO₂, CH₄, N₂O, HFCs, PFCs, SF₆) in metric tons and in tons of CO₂ equivalent.

- Year chosen as base year, and an emissions profile over time that is consistent with and clarifies the chosen policy for making base year emissions recalculations.
- Appropriate context for any significant emissions changes that trigger base year emissions recalculation (acquisitions/divestitures, outsourcing/insourcing, changes in reporting boundaries or calculation methodologies, etc.).
- Emissions data for direct CO₂ emissions from biologically sequestered carbon (e.g., CO₂ from burning biomass/biofuels), reported separately from the scopes.
- Methodologies used to calculate or measure emissions, providing a reference or link to any calculation tools used.
- Any specific exclusions of sources, facilities, and / or operations.

The Standard also provides details on the optional information for a public emissions report.

Chapter ten provides an overview of the key elements associated with a GHG verification process. Verification involves an assessment of the risks of material discrepancies in reported data. Discrepancies relate to differences between reported data and data generated from the proper application of the relevant standards and methodologies. The verification is usually carried out by an independent external third party.

The last chapter of the GHG protocol corporate standard is dedicated to helping companies set and report on a corporate GHG target. The chapter doesn't prescribe what a company's target should be, but rather outlines the steps involved, choices to be made, and implications of the choices.

Assessment of the GHG Protocol Corporate Accounting and Reporting Standard

Comprehensiveness

As a general corporate standard, as well as providing tools for specific sectors within the broader infrastructure categories, the GHG protocol standards provide a significant level of comprehensiveness in terms of infrastructure sector coverage. The GHG protocol focuses specifically on the measurement of GHG emissions. The impact of GHG emissions is widespread and covers arguably the most important metric for measuring environmental sustainability. The corporate standards would be most applicable to brownfield infrastructure assets as established entities with existing cashflows, although the wider GHG protocol toolkit could be used to appraise the sustainability of certain aspects of greenfield infrastructure projects. *Assessment: Comprehensiveness Level - High*

Objectivity

The GHG protocol corporate standard does require internal reporting which would mean that a certain amount of subjectivity might be associated with producing the GHG report. There are clear standardized guidelines provided in the standard documentation that would alleviate the subjectivity to a certain extent. There are also clear guidelines for how verification of the reporting should be carried out, which the documentation recommends should be conducted by a third party. There are directions for how individual projects can be rolled up to provide an assessment at the overall corporate or portfolio level. *Assessment: Objectivity Level - Medium-High*

Clarity

The GHG protocol standards and tools can be applied generally at the corporate level however also provide guidance for specific sectors and countries. While the specificity of the tools is not solely focused on infrastructure, the tools and guidance appear modular enough that they could be applied to specific infrastructure sectors e.g. (Allocation of emissions from a combined heat and power plant tool). As highlighted above, the protocol provides specific guidelines for rolling up specific project assessments to the corporate or portfolio level, highlighting the clarity and standardization of the metrics. Furthermore, the reporting standards align themselves with generally accepted principles for accounting and reporting systems in other areas such as finance, further highlighting the wider usability of the standard. *Assessment: Clarity Level - High*

Transaction Costs

The GHG protocol standards do require the recording and amalgamation of a significant amount of detailed data. While guidelines for collecting, analyzing and reporting this data appear to be very clear, there does seem to be certain amount of expertise and resources required to accurately produce and conform to the reporting standards. Investment might be needed in improving data management and analysis systems. Dedicated labor resources might also be needed to help with producing the required report. The protocol does recommend using a third party to verify the internal report produced which would further increase the costs associated with this standard.

Assessment: Transaction Cost Level - High

Traction

The GHG protocol has been one of the early contributors to the field of environmental sustainability standard development and has been adopted widely. The alignment of the standard's development with other international agencies and organizations, both in the private and public sector, has also led to its widespread use. With the impact of GHG emissions now becoming more widely accepted as a serious threat to the sustainability of the planet, the importance of measuring these emissions, has also increased. The GHG protocol has become a leading resource for this increased need to understand the extent of GHG emissions. *Assessment: Traction Level - High*

CDC ESG Toolkit for Fund Managers

Type: Project Screening

Overview

The CDC Group, formerly the Commonwealth Development Corporation (CDC) is the development finance institution of the UK government, with the Department for International Development being the only shareholder in the company. The entity has arms-length governance from the UK Government which allows it to make investment decisions independent of the government. CDC invests into a wide range of infrastructure projects through direct equity, through debt and through indirect investment funds. All investments made by CDC must adhere to their Code of Responsible Investing, which is made up of six schedules that set out environmental, social and governance requirements. As a result CDC has developed an online Environmental, Social and Governance (ESG) Toolkit that has been adopted by many other investors to appraise their own infrastructure investments with.

The CDC ESG Toolkit for Fund Managers is designed to provide practical guidance to fund managers and others about how to assess and manage environmental, social and governance risks. The online toolkit not only provides assistance in preparing a potential investee's annual ESG report for CDC, it also provides general advice for understanding how good ESG management can benefit companies and investors, for conducting due-diligence on potential new investments, drafting ESG terms prior to investing in a company, managing portfolio companies during the ownership stage, setting up or updating a fund's ESG management systems.

A key part of the CDC tool kit are the sector profiles, for which infrastructure is included. The infrastructure sector profile helps fund managers quickly familiarize themselves with the most frequent and important environmental, social and governance aspects of investments in infrastructure. The toolkit does not however provide investors with detailed technical guidance or specific standards to measure investments against. The CDC ESG toolkit primarily points to the IFC Performance standards and World Bank EHS guidelines for technical reporting measurements.

Assessment of the CDC ESG Toolkit as an Infrastructure Sustainability Standard

Comprehensiveness

The CDC ESG toolkit is more of guidance toolkit which provides qualitative information on the key considerations for investee companies to be in line with investor requirements. The toolkit provides references to other more detailed standard and metric systems. The breadth of sectors covered is similar to those outlined in the IFC Performance Standards, with more detailed descriptions for specific assets such as ports, harbors and terminals, albeit through qualitative recommendations. *Assessment: Comprehensive High breadth, low on depth*

Objectivity

The CDC ESG toolkit provides a framework and in many ways a template for individual companies to report their ESG performance on. While the framework and guidance is provided by CDC itself, much of the reporting is done by the companies themselves, which opens up the process to a certain amount of subjectivity. No investments would be made by the CDC however, unless the investee companies satisfied the organization's benchmarks. The adoption by other investors would be prone to their own interpretation and assessment. *Assessment: Objectivity level – medium.*

Clarity

The CDC ESG toolkit in many ways mirrors the IFC Performance Standards. The framework can be applied to individual projects but the toolkit can also be used at the portfolio or organizational level. The toolkit can be used to establish organization wide policies for a fund manager thus providing a high level of clarity. As discussed above, the level of detail at the project level is more qualitative in nature and refers to other more detailed metrics and standards where necessary and applicable. *Assessment: Clarity medium-high*

Transaction Costs

For a fund manager with little or no existing ESG incorporation, resources would be required to comply with the standards outlined by the toolkit. This might mean employing a consultant to initiate and develop an ESG policy for the fund manager. For an investor adopting the CDC ESG toolkit into their own analysis, this would add to the due diligence requirements, with additional personnel and cost resources possibly needed. *Assessment: Transaction Costs Level - Medium.*

Traction

It would appear that the CDC ESG toolkit has been adopted as a complementary resource to more established resources such as the IFC Performance standards. The CDC ESG toolkit does provide specific guidance for fund managers to help them with incorporation of ESG into their business models and reporting procedures.

Assessment: Traction - Medium

United Nations Principles for Responsible Investment

Type: Accounting Tool

Description

The UN Principles of Responsible Investment (UNPRI) were developed in 2005 when the then UN Secretary-General Kofi Annan invited a group of the world's largest institutional investors (20-person investor group drawn from institutions in 12 countries) supported by a 70 person group of experts from the investment industry, intergovernmental organizations and civil society, to develop the principles. The principles were launched in 2006 and the number of signatories to the principles has grown from 100 to over 1800 currently.

The six Principles for Responsible Investment are a voluntary and aspirational set of investment principles that offer a menu of possible actions for incorporating ESG issues into investment practice. The Principles were developed by investors. Signatories to the UNPRI contribute to developing a more sustainable global financial system. The principles are included below:

- Principle 1: We will incorporate ESG issues into investment analysis and decision-making processes.
- Principle 2: We will be active owners and incorporate ESG issues into our ownership policies and practices.
- Principle 3: We will seek appropriate disclosure on ESG issues by the entities in which we invest.
- Principle 4: We will promote acceptance and implementation of the Principles within the investment industry.
- Principle 5: We will work together to enhance our effectiveness in implementing the Principles.
- Principle 6: We will each report on our activities and progress towards implementing the Principles

There are three categories of signatories to the UNPRI: asset owners, investment managers, and service providers. There is an annual fee associated with becoming a PRI signatory. Being a signatory provides access to all of the support and resources that the PRI provides, including reports and guides, the Collaboration Portal, the PRI Data Portal, a regional Network Manager and reporting and assessment tools to measure and communicate progress. The only mandatory requirement, beyond paying the annual membership fee, is to publicly report on an organization's responsible investment activity through the Reporting Framework. For the first full reporting cycle in which an organization is a signatory, it is voluntary to report, meaning the timeframe for starting compulsory reporting will be somewhere between 12 and 24 months after signing, depending on when in the year the organization signs the Principles.

The PRI Association is governed by the PRI Association Board, which is responsible for upholding the mission, vision and values of the PRI. The Board consists of ten directors, seven of which are elected by asset owners, two by asset managers, and one by service providers. An executive team headquartered in London with offices in Hong Kong and New York are also administered with the running and execution of the PRI.

The PRI has been supported by the United Nations since its launch in 2006 and is also supported by two other UN partners - UN Environment Program Finance Initiative (UNEP FI) and UN Global Compact. UNEP FI works with over 200 financial institutions that are signatories to the UNEP FI Statement on Sustainable Development and a range of partner organizations, to develop and promote linkages between sustainability and financial performance.

UNEP FI attempts to identify and promote the adoption of best environmental and sustainability practice at all levels of financial institution. The UN Global Compact was launched in 2000 as a policy platform and a practical framework for companies to commit to sustainability and responsible business practices. The Initiative attempts to align business operations and strategies with ten universally accepted principles in the areas of human rights, labor, environment and anti-corruption, and to catalyze actions in support of broader UN goals. The UN Global Compact has 7000 corporate signatories in 135 countries.

Both UN divisions help deliver the PRI's strategy and provide additional avenues for signatories to learn, collaborate and take action towards responsible investment.

UN PRI Tools for Investors

The tools provided by the PRI for investors to use in their investments are quite varied and range from: general guidance for asset owners on investment strategy, investment policy, asset allocation and manager selection/ monitoring; specific asset class guidance and tools, for which infrastructure is included; general ESG resources; a collaboration platform for signatories to pool resources together; a data portal that allows signatories to access reported data; reporting tool to help signatories report their RI performance.

The asset owner section of the PRI provides guidance on how to include ESG considerations in every step of the investment process. Reports have been produced for each of the key areas of decision-making – investment strategy, investment policy, asset allocation and manager selection. The reports provide detailed guidance on how to incorporate ESG issues into the most crucial aspects of an asset owner's operations.

The guidance for infrastructure investing by the UN PRI illustrates the key ESG considerations that need to be taken into account. These include:

- maintaining social license to operate
- health and safety standards (pre- and post-commercial operation date)
- biodiversity impacts
- alignment of interest with shareholders
- stakeholder management and community relations
- labor standards
- land rights, indigenous rights
- accessibility and social inclusion
- service reliability
- climate change impact and additionality
- resource scarcity and degradation
- extreme weather events
- supply chain sustainability
- accountability
- board independence and conflicts of interest

- management and board oversight of ESG
- bribery and corruption
- tax policy
- cyber security
- diversity and anti-discrimination

Responsible Investment strategies for infrastructure as per the UNPRI include the following:

- Screening (negative/positive): e.g. sector exclusions, best-in-class investing
- Thematic investing: e.g. renewables, green bonds, social infrastructure
- Integrating ESG: e.g. factoring flooding/drought models into valuation methodologies
- Engagement: investor stewardship through direct (shareholder) engagement and through director appointments to the board

The UNPRI provides guidance on how each of the six UNPRI principles apply to infrastructure investing. Perhaps the most relevant to this study are Principles 1 and 3. The guidance for Principle 1 refers to the approach of the investor organization as whole, and to how the organization's approach to ESG incorporation is implemented in the investment process. The majority of the guidance is qualitative in nature providing insights into how responsible investment can be incorporated into organizational governance, policy and strategy, and portfolio construction. At the project or direct investment level, guidance is given on origination, screening, due-diligence and post-acquisition activities. For Principle 3, which is related to appropriate disclosure on ESG issues, reference is given to the infrastructure fund manager, InfraRed's ESG questionnaire that they use across its portfolio of assets. The questionnaire comprises of 26 questions divided into five sections, of which environmental performance is one of them. It is also encouraged to develop ESG KPIs to monitor each investment, and ensure separate ones are used for greenfield and brownfield investments. Board and risk committee involvement is encouraged as well as climate-related financial disclosures such as TCFD recommendations. Reference is also given to GRESB infrastructure as a tool to help report and benchmark ESG performance of both funds and infrastructure assets across a variety of sectors.

The general ESG issues section of the UN PRI, essentially collate and bring together a wide range of resources on specific aspects of ESG, including academic research, guides to using other recommendations such as the TCFD and other case studies.

The collaboration platform is a private forum for signatories to post resources and share information. Posts to the Collaboration Platform include: invitations to sign joint letters to companies:

- proposals for in-depth research and investor guidance;
- opportunities to join investor-company engagements on particular ESG themes;
- calls to foster dialogue with policy makers;
- requests for support on upcoming shareholder resolutions.

The data portal provides signatories with the ability to access and compare reported data on ESG issues. It facilitates the sharing of best practice/knowledge by giving signatories easy access to each other's reports and serves to also help PRI identify areas of further work based on most popular searches.

Assessment of the UN PRI as an Infrastructure Sustainability Standard

Comprehensiveness: The UNPRI is comprehensive in that it covers a broad range of issues when it comes to Infrastructure sustainability. While nature of the guidelines are mostly qualitative in nature, the PRI provides a valuable resource in collating all necessary information regarding metrics for infrastructure investment. The PRI separates asset owners from asset managers and provides specific guidelines for both parties as well as direct or indirect investors in infrastructure. Guidelines are separated by stage of project development with separate guidelines for greenfield projects and brownfield projects. The UN PRI refers to other standards such as GRESB and TCFD for specific detailed reporting guidance. The level of comprehensiveness will depend on the specific metric used. *Assessment: Comprehensive Level: Medium-High*

Objectivity

The UNPRI reporting tool is a self-reported tool and initially is carried out on a voluntary basis. The tool therefore is open to subjectivity. Despite this, the transparent methodology used to come up with the reports do help to overcome some of the issues with this. Furthermore, the open access to all signatories allows scrutiny in reporting styles by peers and as more data is inputted into the system, it is hoped that the method will police itself from an objective/subjective standpoint. *Assessment: Objectivity Level: Medium*

Clarity

The UNPRI reporting tool is carried out at the portfolio level with specific project assessments adopting other metrics to report on sustainability issues. Being attached to the United Nations and having successfully garnered support from a large number of organizations, the transparency of the UN PRI reporting seems to have improved over time. The UNPRI can be used at the portfolio or organizational level and the integration of other metrics provides a medium level of clarity. *Assessment: Clarity Level – Medium*

Transaction Costs

The UNPRI requires signatories to pay an annual membership fee and after the first 12 months is required to publicly report their responsible investment activity through the Reporting Framework. There is thus a meaningful resource outlay for the UNPRI that may restrict certain organizations from participating. *Assessment: Transaction Costs - Medium-High*

Traction

It would appear that traction for the UNPRI has increased in recent years with over 1800 signatories currently. The UNPRI has come under scrutiny as being a 'tick in the box' exercise without much meaningful activity being achieved. In recent years, it would appear that this image has changed to actively providing services and scrutinizing the reporting of signatories to improve the initiative's rigor. The partnering with other standard providers such as TCFD and GRESB is evidence of the change towards providing a meaningful, robust resource to signatories. The scrutiny placed on the way signatories report has also been an improvement, with signatories being delisted if their reporting is not to the standard required by the association. *Assessment: Traction Level – Medium to high.*

United Nations Sustainable Development Goals

Type: Global Development Framework

Overview

In September 2015, government leaders around the world committed to the 2030 Agenda to achieve in every country a set of Sustainable Development Goals (SDGs) – 17 goals and 169 targets that link the social, economic, and environmental dimensions of human development and well-being. The goals are universal and emphasize dimensions of progress that were lacking in the previous Millennium Development Goals. In committing to them, governments and the United Nations (UN) system acknowledged the need for new partnerships and structures to create a more effective pathway to establishing universal human well-being, good governance and sustainable development. The SDGs in many ways have provided a framework that has guided a more definitive approach to the development of metrics in the broader field of impact and sustainable investment. The SDGs that focus specifically on environmental sustainability include goals 13-15:

- 13. Climate Action: Take urgent action to combat climate change and its impacts
- 14. Life Below Water: Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- 15. Life on Land: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

There also 4 SDGs dedicated to sustainable infrastructure specifically:

- 6. Clean Water and Sanitation: Ensure availability and sustainable management of water and sanitation for all.
- 7. Affordable and Clean Energy: Ensure access to affordable, reliable, sustainable and modern energy for all.
- 9. Industry, Innovation and Infrastructure: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.
- 11. Sustainable Cities and Communities: Make cities and human settlements inclusive, safe, resilient and sustainable.

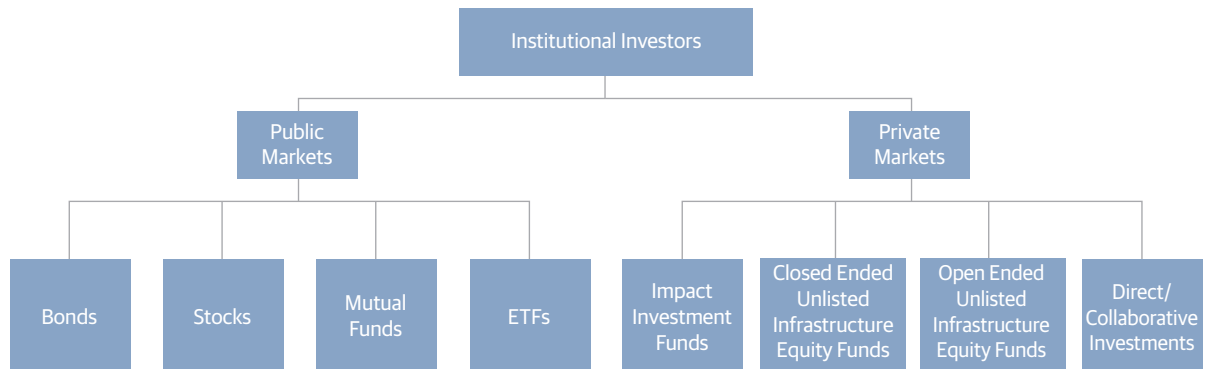
While there is little targeting of the SDGs formally by institutional investors, there has been some adoption of reporting or metrics by service providers to the industry. Just one year after their adoption, 42% of the impact investment industry reported that they use the SDGs to measure and report on their impacts². One of the most commonly used frameworks for assessing impact generally by asset owners is the IRIS Framework, which can be used to report and track impact and sustainability across sectors and asset classes. For the UN SDGs more specifically, a common metric is the Investment Leaders Group (ILG) framework developed at the University of Cambridge, which groups the 17 SDGs into six themes and metrics to simplify and standardize reporting.

Methods of Investment in SDGs

Institutional investors are able to get SDG exposure across the entire asset class spectrum based on their risk appetite and governance capability although the impact of that exposure varies significantly from public market asset classes to private ones. This can be seen in Figure 6 below:

²Global Impact Investing Network. The State of Impact Measurement and Management Practice. 2017.

Figure 6: Institutional Investor Exposure to SDGs



While certainly useful, the breadth of SDGs accessible via public markets is relatively narrow, and the impacts that institutional investors are able to have through this model of investing is fairly low because these listings already enjoy access to the capital markets. Thus institutional investments in publicly listed assets have a relatively low impact if individual investments are relatively small.

Despite the limitations, there are certain public market passive indexes or exchange traded funds that have been developed to concentrate exposure towards the SDGs, providing options for investors. The iShares MSCI Global Impact ETF is one example of a public markets fund designed specifically to address the UN SDGs. The fund targets companies that both employ business practices that further the SDGs and also deliver products or services that directly address one or more of the SDGs. Other ETFs or indexes that have been developed may focus on certain SDGs such as climate change or sustainability such as the Dow Jones Sustainability Index. These are general sector wide products that infrastructure would form a small part of.

Private funds are another model through which institutional investors can gain exposure to the SDGs. Infrastructure investment funds have been created and inherently can address the sustainable infrastructure SDGs outlined above. There are also specific impact investing funds that have been set up with the main objective of creating impact. Impact investing funds vary significantly in their particular strategies, their metrics, and their return targets.

Closed end infrastructure funds must generally maintain fairly high return targets to make the economics of the structure work, in part because of the high fees required by the investment vehicles. These fees are also often both a function of assets under management and investment returns, which further incentivizes fund managers to target high returns. The added layer of fees can limit the use of this model in pursuing some UN SDGs that may require concessional returns, and it also may limit the ability of funds to work with governments and multilaterals to develop investment opportunities, in part because governments are often wary of structuring high-return investment opportunities with private funds. A 2017 survey of impact investment funds reported that more than 60% of the funds were targeting a market-rate or higher investment return, with only 13% of funds reporting that they were targeting rates of return closer to capital preservation³.

³ Global Impact Investing Network. The State of Impact Measurement and Management Practice. 2017.

Closed end funds also naturally limit the ability of institutional investors to actively manage their investments in SDGs. Because private market investing naturally does not have the same disclosure requirements as public markets investing, institutional investors must rely significantly more on their asset managers and other service providers to track their exposure and performance. In 2017 35% of impact investment funds reported that there was no explicit performance metric or formal incentive for investment staff to meet the fund's impact targets, though many of the funds reported that the firm's staff were intrinsically motivated to meet impact objectives¹. While most impact investment funds have active measurement programs and provide reporting to their investors, 43% reported that obtaining quality data from investments remains a significant challenge to reporting, and 32% further reported that aggregating data across the investment portfolio remains a challenge⁴.

Open ended infrastructure funds or direct investments made by institutional investors are likely to have more SDG impact and are more commensurate with the long-term nature of sustainable infrastructure as an asset class.

Measurement Methods of SDGs

To date, the institutional investment industry lacks a common metric for measuring exposure to the UN SDGs, and those investors that measure and report their exposure use a variety of metrics to do so. The reporting of SDG impact for institutional investors can be categorized as either portfolio tracking and asset impact assessment. Both of these levels of reporting are described below:

Portfolio Tracking

Portfolio tracking of exposure to SDGs is perhaps the most common way that institutional investors or fund managers have tracked or reported their allocations to goals in public markets. Under this system, institutional investors and fund managers catalog each of their investments and their exposures to the individual SDGs, and then provide a roll up accounting of each SDG and its weight in their portfolio. Individual investments are "tagged" as furthering SDGs, with some investments accessing several SDGs depending on the nature of the company or asset. A higher order version of tagging individual investments has also been used in categorizing specific industry verticals as impacting each SDG positively (or negatively) and then summarizing the portfolio's impacts based on its exposures to those particular industries⁵.

While portfolio tracking using these metrics is clearly useful, and a strong first step by any infrastructure investor in assessing their performance in furthering the SDGs, it also has some limitations. Firstly, tagging individual investments involves some subjective nuance on the part of investment staff. Additionally, many operating enterprises impact multiple SDGs in different ways and are thus not easily represented by a simple tagging metric.

Asset Impact Assessment

A number of infrastructure investors are turning to more directly measuring the impact of their investment portfolios on furthering the SDGs by rolling up actual operating results. This practice is relatively new and varies significantly among individual investment organizations, and it often requires considerably more resources and operational data in developing an aggregate picture of the portfolio's exposure. While there is no universally accepted standard for measuring all of the SDGs in aggregate, several initiatives have been used to aggregate information relating to some specific SDGs. For the environmental and sustainable infrastructure SDGs there are a

⁴ Research Director, Stanford Global Projects Center Institutional Investment Research Program

⁵ https://www.nip.com/SK_en/corporate/News-Commentary/view/NN-IP-sketches-roadmap-for-investing-in-UN-Sustainable-Development-Goals.htm

number of initiatives that have been developed, many of which have been looked at in this study including GRESB, IFC performance standards, SuRe, ENVISION. These standards are a mixture of measurement, comparison and checklist tools.

Application Examples of the SDGs

The application of SDGs in practice has ranged from Investor groups collating together to provide leadership for the incorporation of the goals into their investment process to new metrics being developed to assess the impact of an investor's actions on a particular goal.

PGGM, a large Dutch pension fund manager, provides an interesting example as a large institutional investor working to incorporate impact investing metrics into their portfolio of investments broadly, with a specific focus on the UN SDGs. As part of a working group of other banks and institutional investors, PGGM identified six SDGs that it would measure investments against four sustainability themes. The selected SDGs include Climate Action, Responsible Consumption and Production, Affordable Clean Energy, Clean Water and Sanitation, Zero Hunger and Good Health and Well-Being. PGGM then selected or developed quantifiable metrics that can evaluate investment opportunities and their performance against the selected SDGs. The scope of PGGM's metrics was limited to capturing the impacts of their current and planned investments, as opposed to limiting investment decisions or explicitly weighing the trade-offs between investment opportunities, but the program has already produced benefits by incentivizing better reporting from PGGMs asset managers and investees and also helped them better formulate how their various investment strategies map to specific impacts⁶.

Some of the most popular metrics that have been adopted to help measure the impact under each of the SDGs include IRIS and GRI. The IRIS system is essentially a catalog of generally accepted metrics that apply to different sectors or operations of an investment. Both qualitative and quantitative metrics are included, and there is no standard template for an IRIS report. GRI is an organization that have produced global standards for sustainability reporting. The GRI standards enable different organizations to report publicly on their economic, environmental and social impacts and show how they contribute to sustainable development. The standards are designed to be used as a set, to prepare a sustainability report focused on material topics.

Assessment of the SDGs as an Infrastructure Sustainability Standard

Comprehensiveness

The SDGs score very highly on the comprehensiveness criterion. The very fact that the SDGs were developed by global leaders with the input of a wide range of stakeholders worldwide suggests that the breadth of sectors covered is extensive. All major infrastructure sectors are covered by the sustainable infrastructure SDGs 6, 7, 9, 11 and the environmental and eco-system factors seem to be well covered by goals 13, 14 and 15. The depth and effectiveness within these goals will depend on the specific metric used and the method of adoption in the investment process. The SDGs do not limit the coverage by stage of infrastructure project, whether in construction, rehabilitation or operation. *Assessment: Comprehensive Level – very high*

⁶ https://www.dnb.nl/en/binaries/SDG%20Impact%20Measurement%20FINAL%20DRAFT_tcm47-363128.PDF?2017091813

Objectivity

Because the SDGs are not a metric in itself, and instead a framework, it is difficult to assess their objectivity. The SDGs provide guidelines and a framework for which metrics and reporting standards can be based. The majority of standards and metrics developed for the SDGs do rely to a certain extent on self reporting and therefore have an element of subjectivity. *Assessment: Not Applicable*

Clarity

Similarly to objectivity discussed above, the clarity of the SDGs is difficult to assess because the clarity of the framework will depend on the specific metric or standard used for a particular SDG. The high level descriptions of each SDG are well defined, which provide clarity for each metric, the effectiveness of the measurement however will depend on the clarity of the specific tool used. The research here on methods of investor incorporation and metrics would indicate that a reasonable assertion of the impact on the SDGs can be aggregated at the portfolio level. *Assessment: Reasonable clarity but aggregation of impact at portfolio level will depend on specific metric used.*

Transaction Costs

The transaction costs associated with the SDGs will depend on how investors utilise them. Most of the metrics and standards adopted to measure SDG impact will require the production of a report that assesses investments or processes for their adherence and impact on the SDGs. Such a report could be carried out internally or externally. If internally produced, dedicated resources would need to be deployed, including at least one or two employees full time for a period of time. By using an external consulting or auditing firm, an investor may save time from internal resources although the cost may be higher. Employing internal resources would indicate a firm commitment to the cause whereas external consultants may be considered a one-off 'necessary hassle'.

The more active investment strategies for SDG impact in either the public or private markets may result in greater costs through higher fees of these 'smart beta' or PE type funds. These strategies could lead to greater returns and so on a net basis, the costs may not be very significant. There may however be consulting fees associated with finding, selecting and monitoring these niche products. *Assessment: Dependent on strategy but mostly restricted to reporting or consulting costs.*

Traction

The SDGs represented the first time in human history that representatives of the global population reached consensus on the way forward for sustainable development. The SDGs have slowly become a key consideration for any organization looking to align themselves with sustainable development. While the SDGs cover a broad set of areas of development, it is clear that most investors considering environmental sustainability for their infrastructure investments, will point to the SDGs and the relevant metrics, standards and benchmarks within each goal to measure their impact. While the exact traction is purely speculative, the fact that the SDGs are prominent in the broader community and general public discourse, this has led to the growing adoption in the investment community, whether asset owner or asset manager. *Assessment: High traction and growing*

Part 3: Discussion

This section includes a summary of the standard review and a general discussion of the current state of sustainability measurement in the infrastructure investment and development industry, based on practitioner interviews across the infrastructure value chain. The subsections in this chapter include (3a) a discussion of the main challenges in designing and applying sustainability measurement and reporting tools in the infrastructure sector, (3b) a summary of the assessments in Chapter 2 of this study and how the metrics studied address these challenges, (3c) a review of trends in applying these tools and the challenges facing industry practitioners, (3d) a comparison of investor sustainability reporting or assessment tools and similar analyses completed as part of the public sector regulatory process, and finally (3e) a detailed comparison between the project screening tools in this study in their use of environmental performance indicators in deriving project scores.

3a. From Theory to Practice – Challenges in Applying Infrastructure Sustainability Standards

The design and use of sustainability standards for infrastructure investment requires standard developers and their clients to navigate a myriad of tradeoffs and challenges. This subsection includes a review of these challenges based on the desk study and interviews with both investors, standard developers and other members of the infrastructure value chain. These challenges or tradeoffs can be grouped as general challenges to the development and implementation of sustainability standards (for any complex asset class) and those that are unique to infrastructure projects and investments. Within the challenges unique to infrastructure, they can be further grouped as either based on the inherent qualities of infrastructure investments, or current challenges facing the asset class as a relatively new part of institutional portfolios. This is a critical distinction, as it can be useful in identifying challenges that are likely to be overcome as the asset class professionalizes and matures and sustainability standards improve and become more widely adopted.

General Challenges of Sustainability Reporting Standard Development

Assessment Rigor v. Adoptability: The most readily identifiable tradeoff in sustainability standard design, for infrastructure or any similar asset class like real estate, is the inherent tension between designing the most comprehensive and rigorous assessment program possible and the desire to maximize uptake, or the desire to incentivize industry participants to “take the leap” and adopt the standard. Here the term comprehensive refers to the range of environmental factors and measurements incorporated into the system as well as the range of sectors or geographies in which it can be applied, and rigor to the requirements of the assessment itself and whether performance is well documented or examined by 3rd parties. Optimizing for these goals naturally entails higher transaction costs to implement the system. It also may increase the subjectivity of aggregated scores at the project or portfolio level as more and more factors are included in the analysis. These factors may reduce the willingness of potential users to implement that metric system.

This is an important consideration for several reasons. First, all of the developers of standards included in this study do not consider optimal sustainability reporting to be an end in and of itself, but rather a means to achieve an ultimate goal of more sustainable infrastructure development and management. Uptake is thus important – a perfect sustainability measurement system that is never used does not further its objective. This necessitates finding a balance that is comprehensive but does not create disincentives for practitioners in adopting the

standard. Uptake is also important because it is necessary for the improvement of the standard itself. Greater use provides more data and thus better improvements to the system over time, better benchmarking, and more recognition of the system as an industry standard. Any standard for sustainable infrastructure or any other asset class must thus strike a balance between these competing priorities. Currently most of the systems included in this study have low levels of adoption in the infrastructure sector, partly due to the fact that most of the standards have been developed in the last few years.

Management v. Performance Criteria: The standards included in this study also needed to balance their assessments and the relative weightings of both direct environmental impacts, in the form of performance indicators, and indirect standards in the form of management practices or policies. Most standards in this study include both to determine project ratings, and some explicitly identified those criteria that were based on performance indicators and those based on practices. This again necessitates tradeoffs in standard design. To the extent they can be accurately measured, environmental performance indicators, or at least performance indicators relative to a benchmark, are arguably the criteria that standards and investors should be optimizing for. However, the inclusion of best management practices and policies in standards clearly has secondary impacts on environmental performance. It gives investors or project managers a direct incentive to more accurately manage or report on sustainability performance to earn points against management practice criteria, regardless of whether the project also earns points for environmental performance indicator criteria in the same category. In many cases, and especially for infrastructure, standards based on management practices may also be more objective criteria when compared to performance indicators.

Verification v. Aggregation: Finally, many of the standards included in this study fall along a spectrum in the degree to which they facilitate the aggregation of results at the portfolio level and the degree of verification they require for certification. Figure 7 is another subjective assessment of a subset of the various metric systems included in this study along two axis. The first axis illustrates the degree to which verification is required in the rating process for individual projects. Here the systems included in this study range from objective 3rd party assessments, to 3rd party verification for each project, to spot or peer verification, to no verification requirements. The second axis is illustrative of the degree to which the metric system enables the aggregation of results.

Figure 7: Assessment Verification Requirements and Result Aggregation



This is another subjective assessment in nature, but it does illustrate another area in which the developers of metric systems or accounting tools must find a balance. There is also a clear delineation here between the accounting tools and the project screening or rating tools included in this study. It is worth noting that all metric systems in this study are aggregable at the level of project ratings. The measure of aggregation shown in Figure 7 illustrates the degree to which individual performance indicators or metrics can be aggregated at the portfolio level. Many of the project screening or rating tools included in this study require rigorous verification processes, but do not enable the aggregation of reporting for a portfolio of projects outside of the rating achieved by each project assessed. Many of the accounting tools have lower verification requirements but focus on environmental performance indicators that can be aggregated for reporting purposes. GRESB in this analysis enables the partial aggregation of reporting data because it enables the aggregation of environmental performance indicators (a small component of its project assessment) and also has a relatively less-rigorous verification requirement in comparison to some of the other project screening tools, which is mostly through document verification in addition to spot checks by its verification team.

Challenges Unique to Infrastructure Development

Asset Class Maturity: As a relatively new asset class for institutional investors, infrastructure investment standards and benchmarking also lag a bit behind other, comparable industries for both sustainability and other objectives. As the asset class matures, there is every expectation that sustainability standards for the industry will also mature in tandem. Infrastructure may be allocated within its own asset class grouping, or it may be considered and included under other asset class labels such as private equity, alternative assets, or real estate. For sustainability standards and otherwise, the real estate asset class is often used as a comparable but relatively more developed allocation in institutional portfolios. Sustainability standards in real estate are thus often used as an indicator of the direction in which sustainability standards in infrastructure may evolve as the asset class matures, and in fact many of the standards included in this study were created by organizations or associations that first developed similar standards in the real estate sector. This comparison certainly has merit, but the infrastructure asset class also poses unique challenges for standard developers, above and beyond those discussed in the previous section.

Scope of Analysis: Perhaps the most readily observable challenge to measuring sustainability for infrastructure projects relative to other asset classes is simply the scope and scale of their environmental impacts. For real estate, the scope of environmental impacts is largely internal, or confined to the building shell (a “closed system”). The case for most infrastructure projects is more complex. Infrastructure projects entail a wide range of environmental impacts far beyond the materials and footprint of the projects themselves (an “open system”). Take for example the complexity and wide reaching impact of a power station, transmission lines, an airport or a major highway network. This naturally makes measuring or estimating their environmental impacts and performance indicators much more difficult. As technology and methods to measure impacts improve over time, this may be mitigated, but the question of an appropriate scope of analysis will always be more important for infrastructure assessments relative to other asset classes.

Materiality: Another characteristic that sets infrastructure projects apart from other asset classes, notably real estate, is the degree to which projects are idiosyncratic or unique, and the scale of the individual projects

themselves, both in terms of total costs and environmental impacts. More so than other asset classes, different factors in infrastructure will be more important given the location, project type and standards of the society. Within this diverse industry, context is extremely important, and projects face a very different range of environmental challenges both across different sectors but also between projects based on their location and regulatory regime. This renders the development of sustainability benchmarks for infrastructure assets extremely challenging, and further increases the importance of materiality in crafting sustainability standards for the sector.

Materiality here refers to the relative importance of different environmental criteria for the particular project in question, and also potentially what constitutes good performance under that criteria. Applying materiality in an infrastructure sustainability standard poses its own set of tradeoffs. On one hand it certainly makes sense given the heterogeneity of the asset class – a standard without materiality may create conditions which disadvantage some sectors over others or, worse, score a particular project based on performance or practices that simply aren't relevant to the project in question, putting project sponsors in the difficult position of deciding whether or not to optimize for the standard knowing it will not improve performance. Materiality could be applied based on the sector or regulatory regime of the project, but this could still miss nuances between projects. Take, for instance, airports located very close to urban centers compared to those located in less dense areas. The materiality of noise pollution for an assessment of those two projects is understandably different. In addition to impacting which performance criteria are important, materiality may also influence what constitutes good performance based on a project's context. In designing performance indicators based on habitat or species protected, for instance, performance based on acreage or number of species is extremely dependent on the local context of the project – strong performance may be completely different depending on the local environment for projects that would otherwise be very similar.

On the other hand, the inclusion of materiality in an assessment also comes at a cost. Any assessment of materiality at the project level naturally creates an additional layer of subjectivity in the standard and thus reduces users' ability to aggregate reporting across projects or compare projects to benchmarks. Including materiality in an assessment may make the assessment more relevant to the project itself, but it makes it more difficult to clearly communicate or aggregate information upstream along the industry value chain. This is an important tradeoff that is somewhat unique to the infrastructure sector. Sustainability standards for any industry must be relevant to both project managers on the ground and portfolio managers at institutional investors, and every level of the value chain in between. The question of whether, and how, to include materiality in an assessment is thus another delicate balance that standard designers in the infrastructure sector must navigate.

Regulatory Context: Infrastructure is also unique in the degree to which public sector evaluations already impose minimum sustainability requirements on projects, and this is another area in which sustainability standards face tradeoffs. There are many potential benefits to the development and adoption of sustainability standards in infrastructure, including the promotion of general best practices in sustainability management and reporting. Another objective, however, is the promotion of sustainability above and beyond that which is required by regulation. This presents another challenge for standard designers in the infrastructure sector in creating a standard that is comprehensive in scope, in that it can be applied across regulatory regimes, or one tailored to a particular jurisdiction. This impacts both the number of projects to which the standard can be applied and also the range of potential users. At the institutional portfolio level, infrastructure allocations are often invested globally, which increases the utility of standards that can be applied across regulatory regimes. This may be in tension with utility at the project level, creating another tradeoff for standards in the benefits of tailoring to local regulatory context and the benefits of aggregating data at the portfolio level.

3b. Adapting to the Challenges – General Findings from the Desk Study

The infrastructure sustainability standards included in this study take a wide range of approaches in addressing the challenges above. This subsection includes a general discussion of the differences between standards and specifically addresses how many of them balance between the competing priorities described in the previous section.

Standard Review Summary

There is no single scale or scoring rubric that can succinctly and accurately capture the distinct positions of the standards included in this study, even on our evaluation criteria of comprehensiveness, objectivity, clarity, transaction costs and traction. One framework to better understand how these standards differ is that they all, to some extent, optimize for the perspectives of the organizations that helped developed them. Envision, which was developed by associations of engineering and construction firms, takes a more practical, management practice-oriented approach to its ratings. SuRe, which was developed by an international infrastructure investment foundation, optimizes for applicability regardless of regulatory regime. GRESB, which was formed by an organization that originally developed standards for institutional real estate portfolios, caters its system to facilitate aggregation of sustainability reporting across a network of projects. Likewise ISCA, which was developed in close collaboration with the Australian commonwealth and state governments, is more closely tied to its local public regulatory regime than its international counterparts.

The IFC performance standards were developed as requirements for projects to adhere to in order to qualify for IFC funding. Similarly, the CDC toolkit was created to provide guidelines to fund managers that were looking to attract capital from CDC. The early adoption of the IFC performance standards and equator principles coupled with a lack of other specific guidelines for infrastructure, has meant the standards have been used for projects all over the world and by investors in both developed and emerging economies.

While the TCFD and SASB have been developed in some respects by independent panels, the closeness with the services industry in general might skew the weighting towards helping to develop certain aspects of the financial sector. SASB for example explicitly mentions the need for advisors and lawyers to assist with the development of SASB reports.

Table 6 includes some summary information on the types of standards included in this study, their use cases, their performance and management criteria, and methodology. Here, the standards studied are categorized as Project Screening methods, or Accounting Tools. As mentioned above, the Project Screening category is used for standards focused on the detailed review and scoring of individual infrastructure projects. The Accounting Tool category describes general or tailored standards to report sustainability information. We have omitted the UN SDGs from the table as the SDGs can be classified as a framework as opposed to a specific screening or accounting tool. We do note however that there are standards that have been developed since 2015 to measure the impact of the SDGs for various investments. While GRESB is classified here as an accounting tool, we recognize that it is more commonly used as a Portfolio Aggregation tool as it is oriented towards developing portfolio level insights from project data. The CDC toolkit is classified as a 'project screening' methodology because it is used to screen investment managers for investments, albeit at the fund level as opposed to the individual project level.

Sustainability Standard Summary Information

Standard	Category	Year Developed	Criteria	Geographical Applicability	Materiality	Aggregation	3rd Party Verification	Traction
SuRe	Project Screening	2015	61 Criteria (15 PC / 46 MC)	Global	By Project	No	Assessments Completed by 3rd Party	New. None.
Envision	Project Screening	2015	60 Criteria (mixed PC / MC)	Currently US / Canada. Potentially International	None	No	3rd Party Verification	New. 275 Corporate Members
CEEQUAL	Project Screening	2002	9 Sections (mixed PC / MC)	Current UK / Ireland. Small International	By Project	No	3rd Party Verification	Very high in UK and Ireland
IFC Standards	Project Screening	2006	8 Broad Categorical Assessments	Global	None	No	IFC Review	High
GRESB	Project Screening	2016	-40 Criteria (25 PCs)	Global	Currently Incorporating	Yes	Low. Spot Check Verification	New. 160 Projects
SASB	Accounting Tool	2012	Determined by Sector	US Focused Currently	By Sector	Yes	None	Low
TCFD	Accounting Tool	2015	Determined by Sector	Global	By Company	Yes	None	New. Low.
ISCA	Project Screening	2012	16 Categories	Australia / New Zealand	By Project	No	3rd Party Verification	High but Local
GHG Protocol	Accounting Tool	1998	Limited to GHG Emissions	Global	By Sector	Yes	Low - Some Verification Guidelines	High
CDC Toolkit	Project Screening	2007	6 Reporting Schedules	UK Focus, but Global Applicability	By Sector	Potential	None	Medium
UN PRI	Accounting Tool	2006	6 Principles	Global	By Sector	Yes	Weak (Peer Validation)	Medium-High

How Standards Address the Challenges

The standards included in this study provide a range of tools for infrastructure investors and other members of the value chain to address the challenges of sustainability accounting in the sector and promote increased adoption.

Management and Performance Criteria: Those standards that involve a certification based on project screening, all include both management practices and environmental performance indicators in their assessments, and are weighted towards the former. This is one of the main differentiators between these project screening tools and the more general accounting tools included in this study. Among the screening tools, there is some general consensus in that they have all currently settled on a combination of performance indicators and management practices in developing project ratings and scores for specific criteria. They certainly differ in the specific performance indicators used, and in the delineation of criteria based on performance indicators and those based on management practices. Some rating tools highlight the criteria involving performance indicators while others combine them with management practices in many criteria. As a broad generalization, many of the screening tools that combine the two types of metrics for a criteria will award lower levels of points for management practices that address criteria, additional points for demonstrating that the project's performance indicators have been improved over some kind of a benchmark, and the highest levels of points for projects that demonstrate a net-zero or restorative impact in its performance indicators. This particular topic is addressed in more detail in Section 3e.

Verification and Adoption: The project screening tools in the study generally have higher levels of verification than the accounting tools, but within the screening tools they are differentiated in the degree to which project reports are verified. The rigor of the system's verification process is necessary to inspire trust in the system's resulting scores and protect against greenwashing, but it is also tied to the amount of work or transaction costs for project managers and investors to complete the rating process. It is noteworthy that the project screening tools that have seen wider adoption – the IFC performance standards and ISCA in Australia – have also been supported to some degree by mandates. The IFC standards are required for projects that the IFC supports, and ISCA assessments are mandated by public sector project sponsors for some projects in Australia. Without mandate support, standards incentivize adoption by providing utility to (usually upstream) participants in the value chain through the aggregation of performance data, or by minimizing transaction costs.

Materiality: For the project screening tools, the inclusion of materiality naturally runs counter to the ability to aggregate reporting information at the portfolio level. GRESB's current initiative to incorporate some degree of materiality to its project assessments while remaining a portfolio aggregation tool is an exception here, and is too recent for the results of the initiative to be meaningfully appraised. Even certain accounting tools, which provide for materiality tailored reporting standards by sector or company, are limited in aggregating data across an infrastructure portfolio that is diversified by sector. The GHG protocol is another exception in this case, partially due to the fact that it is strictly based on performance indicators in a limited but critical aspect of sustainability reporting (emissions).

Here the screening tools, many of which include materiality by project, again differ in the extent to which it effects project scores. SuRe provides for some criteria to be ruled out of project scores based on materiality. ISCA and CEEQUAL include materiality in both ruling out criteria and weighting the points for criteria. Envision and GRESB were designed without incorporating materiality to reduce subjectivity, though GRESB is not incorporating materiality in some form.

Global v. Local Application: Many of the accounting tools included in this study have adopted a global orientation in their scope, while the tools for project screening have been more oriented towards a particular regulatory regime. The project screening standards that are exceptions here are the IFC performance standards and SuRe, which were designed to be applied globally. This may be a somewhat inaccurate characterization of those assessments, however, because the design of those screening tools actually limits their applicability for projects in more developed economies or countries in which the IFC does not invest, as these nations generally have stricter regulatory regimes that already require adherence to many of the criteria included in those assessments. The different orientations of each standard in balancing between being tailored enough to be relevant at the individual project level while also being globally applicable and aggregable at the portfolio level illustrates where this tradeoff occurs – specifically in environmental performance indicators and how they impact project scores. Project screening standards designed to improve sustainability performance above and beyond that required by regulation are naturally tied to those regulations and thus provide less insight when aggregated in an international portfolio of investments. GRESB addresses this challenge by largely designing its portfolio indicator scores to focus on performance based on a benchmark of similar projects, rather than performance above and beyond that which is required by regulation.

Many of the project screening tools have adapted very recently to be applicable outside the regulatory regimes for which they were designed, with very early results. Envision states that the system can be tailored for use outside the United States and is currently being used for its first international project in Turkey. CEEQUAL has developed an international version for projects outside the UK and has been applied for several international projects, mostly in Hong Kong. ISCA has also developed an international version of its assessment for use outside of Australia and New Zealand.

3c. An Evolving State of the Practice

Metric developers and supporters of better sustainability reporting by infrastructure investors and their service providers thus face many challenges and tradeoffs, and are experimenting with ways to address them. In practice, though, and despite the significant progress observed in the adoption of many of the tools included in this study.

One of the issues facing metric developers and investors in using sustainable infrastructure tools involves the reference to science-based evidence in metric design and whether the standards actually drew upon scientifically proven evidence in their development and application. Many of the standards did not produce the science themselves but referred to other entities that had produced the research behind the standards used. The most commonly referenced sources included the Intergovernmental Panel on Climate Change and the GHG emissions protocol. The standards reviewed varied in their inclusion of science-based metrics. For example, one of TCFD's key recommended disclosures focuses on the resilience of an organization's strategy, taking into consideration different climate-related scenarios, including a 2 degrees Celsius or lower scenario. Material disclosure in this case is related to scenario planning for specific temperature change situations. Other initiatives such as the CDC toolkit, focus primarily on a qualitative checklist to bring fund managers in line with their standards for sustainability, and where required refer to other initiatives for a specific scientific or numeric standard.

While the purpose of this study has not been to rigorously assess the science behind the standards developed, this is a key area for future research. The initial findings from this study would suggest that the adoption of sustainability standards might be influenced by the scientific rigor behind the metrics developed.

In practice, it is clear that large parts of the infrastructure investment sector have not yet adopted a single uniform assessment or reporting tool for their investments. This may be due in part to the fact that no single tool or system has emerged as a global standard for the industry, and this is a common concern from many industry participants and advocates for the broader adoption of standard reporting tools by the industry. It is worth noting, however, that those infrastructure investors that have taken the most proactive approaches to sustainability reporting and management have not, as an industry or even as individual institutions, coalesced around a single accounting or rating system. Rather, they are using many of the systems at once depending on their specific needs and the local context of the project, using different reporting standards for different projects based on the requirements of each investment. Given the heterogeneity of the asset class and the wide array of tools available, this should be an expected outcome.

The opportunity and need for data providers and data analysts in infrastructure sustainability reporting was evident in this review. With sustainability reporting being at an early stage of development, the increased adoption by investors and more standardized nature of the reporting will mean significant amounts of data will be produced in the field. Furthermore, as noted, the complexity of infrastructure projects and the increased use of technology sensors, means that vast amounts of performance and other related data will likely be collected in the future. Specialists that can process and analyze the data to provide actionable insights will be crucial to the development of robust sustainability standard reporting.

Increased adoption is thus a commonly cited challenge for the industry, but there is not consensus on a single path towards the broader use of sustainability tools for infrastructure investors. One way to promote adoption would be to improve the ties or information flows between the different accounting and project screening tools included in this study, which would thus improve the aggregation of data across investor or public sponsor portfolios of projects that complete assessments with different tools. Another way would be to improve the documentation or feedback loops for managers at the project level to better demonstrate how the use of sustainability metrics and assessment tools improve project outcomes, including financial or operational performance. Finally, and as noted in the previous section, adoption can be promoted by either reducing the costs associated with doing so for investors and project managers, or by wining mandates from upstream institutional investors or public sector sponsors of infrastructure.

3d: Interplay between Investor and Public Sector Sustainability Metrics

While the sustainability rating, certification and accounting tools included in this study are relatively new, standards to assess or quantify environmental or social performance for infrastructure projects have been in use and have continued to evolve through public sector environmental review processes. Infrastructure projects in certain jurisdictions undergo extensive environmental reviews, public consultations, and mitigation before approvals for construction are granted. While the specific policies, requirements and practices differ significantly by regulatory regime, they share some common, general aspects that differ significantly from the general requirements of the investor-oriented metric or certification systems included in this study.

Some of these differences between public sector and investor sustainability metrics are by design. Regulatory requirements are, after all, a requirement governments place on infrastructure projects in their jurisdictions. The investor metrics included in this study are, except in a few select cases, voluntary on the part of investors or

project sponsors, and in fact are intended specifically to measure sustainability practices and performance above and beyond that which is required by the aforementioned regulations, naturally differentiating the two. There are additional, specific practice areas in which these two applications of sustainability metrics differ, however, that make for a useful point of comparison.

Preserving v. Conserving Assessment

One of these is largely based on the objective for which public sector metrics and investor metrics were developed. Public sector environmental metrics are fundamentally completing a preservationist assessment of a potential project. This refers to whether, or what, if anything, will be built. In other words, regulatory sustainability assessments by governments must always have a “no build” option, and are in fact being completed expressly to determine whether that option should be exercised. Investor evaluation or reporting systems naturally must be more conservationist in nature, in that they are oriented towards a project that will be built and designing, developing and operating it in the most sustainable way possible. It is worth noting here that this delineation refers to the general orientation of the two types of assessment. Just as regulatory assessments also include monitoring and compliance of projects as-built, investor evaluation systems can help them determine which projects to build or invest in.

This difference in orientation is likely a contributor to the different focus areas of public sector and investor sustainability reviews. Investor metrics, for the most part, are very focused on sustainability outcomes and performance indicators, with assessments or certifications largely completed after projects are completed and in operation. Public sector reviews are much more focused, though not exclusively, on the planning and design phases of the project as part of the approval process for construction. Public sector environmental analysis is thus very reliant on forecasts and estimates of future potential impacts in ways that investor metrics are not, at least for some performance indicators.

Balancing Between Comprehensive Analysis and Objectivity

The forecast-orientation of public sector environmental assessment may also be tied to the general difference in assessment rigor, in terms of environmental impact valuation, when compared to private sector counterparts. As a broad generalization, sustainability assessments completed during the public sector permitting process are more likely, relative to investor assessments, to quantify environmental impacts and benefits for inclusion in Environmental Impact Reports and to discount those impacts to the present for indicators of project value that include forecast environmental or social costs and benefits. This practice is very rare for investors assessing sustainability or environmental impacts, in part because these impacts are extremely difficult to quantify in valuation. None of the investment organizations interviewed for this study went to the extent of completing environmental valuation of impacts and aggregating them for portfolio-level reporting.

Relative to environmental valuation, the point scoring systems of project rating tools and the accounting tools used by investors utilize more objective or verifiable metrics for assessing their sustainability. The management practices and environmental performance indicators included in those systems have their own degrees of subjectivity, and their translation into points or credits inherits the subjective weightings of the metric designers. However, relative to environmental valuation those systems require far fewer assumptions on the part of the evaluator and are based on relatively observable or verifiable actions or achievements.

Aggregation

Some of the investor metric systems further stand out in their design towards aggregation, or portfolio-based environmental or scores for comparisons across projects and also to assess sustainability in aggregate for a single investor or an institution. There is no such parallel in public sector environmental assessments, which are, for the most part, focused on project-by-project reviews and approvals. More recently, several regulatory regimes have begun experimenting with more programmatic environmental permitting, which would take an aggregate approach to meeting sustainability goals.

The interplay between investor metrics or certification tools and local environmental regulations has begun to take shape for some of the systems included in this study, notably for country-oriented certification tools like ISCA and to a lesser extent CEEQUAL. This has been a considerable driver of adoption for both certification systems. ISCA serves as the most significant example of this trend, as the certification tool has been adopted by many public sector infrastructure sponsors across state, local, and the commonwealth governments in Australia. Many of these public sponsors have adopted ISCA as a mandatory requirement for the projects they procure depending on the size of the project and other factors. CEEQUAL has also developed stages of certification for both public sponsors and full-team, as built certifications to provide incentives for public sponsors in the UK and Ireland to adopt the rating system early in project planning. The IFC Performance Standards refer to the US Environmental Protection Agency guidelines for measuring impacts within certain sectors.

Mandating investor certification systems has largely been the extent of the interplay between investor certification tools and public sector environmental approvals to date. In the future there could be more nuanced, even joint assessments as investor metric developers continue to adapt their systems to local regulatory context. In the future, it would be feasible that projects that achieve certain levels of certification via rating systems could be exempt or receive expedited environmental approvals pre-development, though it is unclear if this will ever be the case. None of the assessment tools included in this study were directly tied to local environmental permitting in this manner, and given the relative focus of investor and public sector assessments (with the latter focused on planning and permitting, and the former focused on ex-post performance) it is unclear if the two types of assessment will be more directly coordinated in the future. As institutional investors play an increasing role in developing new greenfield projects however, the incorporation of public sector permitting standards into infrastructure investment sustainability standards may start to converge. This will be more relevant for those investor standards that are specific to the infrastructure asset class as opposed to the general corporate or sector agnostic investor sustainability standard systems.

3e. Use of Environmental Performance Indicators in Infrastructure Rating Systems

The metric and rating systems included in this study also differ significantly in their use of environmental performance indicators in developing project-level scores. Most of the screening tools included in this study addressed sustainability metrics such as carbon emissions, water conservation or runoff, ecosystem or species protection, and energy use via a variety of metrics. While they uniformly addressed these sustainability topics, there was some variation in how performance indicators translated to project scores. This section reviews a subset of the screening tools included in this study and their use of performance indicators on specific topics. It should be noted here that many of these factors are included in various, interrelated components of project screening tools, and many of them partially develop scores based on management practices relating to each criteria. This section is focused specifically on environmental performance indicators alone, and in some cases

focuses only on the criteria or section of the screening tool explicitly focused on the topic under review. This is not a complete summary of every performance indicator used by every screening tool.

The subsections below detail the performance indicators used to develop scores relating to carbon emissions, ecosystem and species protection, and water use / water pollution for some of the project screening tools in this study – SuRe, Envision, GRESB, CEEQUAL and the IS rating system.

Carbon Emissions

SuRe: Performance Level 1 is awarded to projects that demonstrate lower Scope 1 & 2 carbon emissions than a benchmark for similar projects. Performance Level 2 is awarded for projects that demonstrate zero net carbon emissions. Performance Level 3 is awarded for zero net carbon emissions in operation through Scope 3, along with justification that construction phase emissions were limited through mitigation measures.

Envision: Projects are awarded points for increasing levels of achievement. Four points are awarded for completing a life-cycle carbon assessment. 7 and 13 points are awarded for demonstrating 10% and 40% greenhouse gas reductions respectively. 18 and 25 points are awarded to project that demonstrate that they are carbon neutral and carbon negative, respectively.

GRESB: Projects report units of economic or other output for the project, along with Scope 1 and 2 carbon emissions over time, along with a baseline and targets for future years. Score is calculated based on the amount of coverage provided, in terms of annual data and targets, trends in improvement over time, and the ratio of economic output to emissions.

CEEQUAL: Series of questions that measure carbon-related management practices, such as the inclusion of lifecycle assessments for construction and materials, in addition to points for demonstrating that carbon emissions have been reduced relative to the life-cycle assessment.

ISCA: Level 1 achievement and associated points are awarded for the completion of a life-cycle assessment and demonstration that carbon emission reductions were implemented. Additional points are awarded for up to 30% carbon emission reductions compared to a base case footprint.

Ecosystem and Species Protection

SuRe: Several criterion address management practices in relation to biodiversity and ecosystems. The primary performance indicator-based criterion awards Performance Level 1 for projects with mitigation measures that exceed industry practice, Performance Level 2 for projects with no net loss of biodiversity and habitat, including offsets, and Performance Level 3 for projects with a net positive impact.

Envision: Several different credits address habitat, wetlands, farmland, and geology. The primary credit for habitat awards 9 points for projects that avoid development on prime habitat, 14 points for projects that protect habitat in a 300 foot buffer zone around the project, and 18 points for projects that restore habitat.

GRESB: Projects report units of economic or other output for the project, along with wildlife fatalities each year along with targets. Projects also report area of habitat removed, enhanced, protected on site and conserved off site. Score is calculated based on the amount of coverage provided, in terms of annual data and targets, trends in improvement over time, and the ratio of economic output to ecological performance.

CEEQUAL: Several questions award points partially determined by management practices such as ecological assessment and monitoring. Questions that address performance indicators award points based on the percentage of ecological features identified in a site study that are either conserved or mitigated.

ISCA: Levels of achievement partially determined by management practices such as ecological assessment and monitoring. Performance Levels 1 and 2 also determined by projects that demonstrate no net loss and net gains for ecological outcomes, respectively, including offsets. Performance Level 3 is awarded for net ecological gains on site.

Water Use and Water Pollution

SuRe: Several Criterion address this topic, one of which awards Performance Level 1 for projects that reduce water use more than international practices, treat stormwater up to 80th percentile precipitation events, and use captured or recycled water for 70% of its outdoor water needs. Performance Level 2 is awarded to projects that consume zero net water, treat stormwater up to 90th percentile precipitation events, and use captured or recycled water for all outdoor water needs. Performance Level 3 is awarded to projects that improve water quality or quantity, and treat stormwater up to 99th percentile precipitation events.

Envision: Several credits address water use and stormwater runoff. The stormwater credit awards 4 points for improvements in storage capacity for brownfields and greyfields and 100% stormwater storage capacity for greenfields. 9 and 17 points are awarded for brownfield and greyfield projects that increase water storage by larger and larger magnitudes. 21 points is awarded for projects that are restorative by keeping more than 100% of stormwater on site and improving the hydrologic conditions of the undeveloped site. Another credit awards 4, 9, 13 and 17 points for projects that reduce potable water consumption by 25%, 50%, 75% and 100%, and awards 21 points for projects that recycle more potable water than they use. Other credits address freshwater availability, floodplains, groundwater contamination and wetlands.

GRESB: Projects report units of economic or other output for the project, along with potable, surface, sea and ground water withdrawn and discharged over time, including targets for future years. Score is calculated based on the amount of coverage provided, in terms of annual data and targets, trends in improvement over time, and the ratio of economic output to water consumed and discharged.

CEEQUAL: Several questions award points partially determined by management practices such as water monitoring and an impact plan. One of the questions awards points for projects that demonstrate that any impacts on ground or surface waters have been mitigated.

ISCA: Several different credits address water discharge, runoff and consumption. One of the performance indicators in the Receiving Water Quality credit awards Level 2 achievement for projects that demonstrate no recurring or major exceedances of water discharges and which do not increase peak stormwater flows for a 1.5 year precipitation event. Level 3 achievement for that credit is awarded to projects that demonstrate no exceedances of water discharges at all. The credit for water use awards points for projects that demonstrate reductions in water use up to 30% compared to a base case. Another credit awards Level 2 achievement to projects that demonstrate no adverse impacts to water resources to the surrounding area.

Discussion

The performance indicators reviewed above do not account for materiality assessments included in some of these project screening tools, which may have implications for the weight of scores for these criteria and whether or not they are included in a particular project's rating. Still, the importance of context is clearly identifiable in the way many of the project screening tools account for environmental performance indicators, with many of the performance indicators translating to points or levels of achievement via improvements on a baseline, whether that is a similar project, a baseline study completed by the project, or units of economic or beneficial output in the case of GRESB.

Many of the screening tools use a similar formula for the development of project scores on topics that relate to environmental performance indicators. Low scores or levels of achievement are generally awarded for management practices, such as monitoring, assessments and the optimization of designs to account for performance indicators. Middle scores or levels of achievement are then awarded based on percentage improvements relative to a baseline. High scores are based on performance indicators directly through the demonstration of zero net impacts or positive net impacts on the particular performance indicator.

Part 4: Conclusions and Areas for Future Research

The objective of this desk study was to summarize and assess the nature of sustainability standards that have been developed for the infrastructure investment sector. The topic of environmental sustainability in investment decision making has risen in prominence in recent years as investors have started to recognize the material impact that climate change and other environmental change can have on their portfolios. Because of their scale and wide-reaching impact as well as the long time horizons within investment portfolios, the importance of understanding the impact of infrastructure investments is extremely topical and pertinent. The methodology and approach of this study has primarily focused on an extensive literature review and desk study of some of the most common standards currently adopted by infrastructure investors globally. The findings from the desk study were complemented by interviews with the developers and users of the standards as well drawing upon the authors' experience of working directly with institutional investors, developers and public agencies in the field of infrastructure investment.

This study has a primary focus on the standards developed for investors in infrastructure. At the outset, we acknowledge that the standards developed for investors are created via a *conservationist* approach as opposed to a *preservationist* approach, used by public sector agencies. The main difference being that public sector agencies, in a preservationist mode, usually provide environmental sustainability measures to decide whether a project should go ahead or not. Investors on the other hand, are looking to reduce the environmental sustainability impacts for projects that are already in place, through their conservationist approach.

The reporting systems analyzed in the study were grouped into two categories: Accounting Tools and Project Screening Systems, with all twelve being evenly allocated to each category. Each of the standards were assessed along a five-dimensional framework that included appraisals of comprehensiveness, objectivity, clarity, transaction costs and traction. A key consideration for assessment and for the categorization was whether the metrics used to assess sustainability could be aggregated from the project level to the portfolio level. We recognize that many of the standards included in the study have been designed differently and are looking to achieve different objectives. This makes a comparative assessment very challenging. The purpose was therefore not to compare the standards against each other but to appraise the standards (albeit subjectively) against a consistent framework.

Through the study, we observed that there are a number of challenges associated with the development of sustainability standards for infrastructure investment. While the scale of potential impacts may be greater for infrastructure, it is also significantly more difficult to apply standardized measurement tools within the sector. Materiality, defined specifically as the degree to which assessments or accounting tools should be tailored to the local context of the project was a central challenge in the development of standards. A single assessment tool or accounting standard that could aggregate information between different sectors, under different regulations, and in different geographies is an attractive goal, but perhaps impossible to design. Materiality has however been incorporated in many of the assessment tools for project-level ratings. This takes various forms, including the development of weighting scales to score certain environmental considerations as relatively high in comparison to others, or opportunities for project sponsors to request to opt out of individual metrics as irrelevant to their study. The proliferation of investor tools and metrics tailored to particular sectors or regulatory regimes is thus likely to continue in the near future, rather than the industry coalescing around one single project screening or accounting tool for reporting. One promising area for future research and development by practitioners and tool designers is ways in which the various tools overlap, can be integrated, or made to "talk" to one another to provide some aggregate sustainability reporting across systems.

In the standard assessments, there was also a trade-off between measuring environmental performance indicators and management practices associated with projects. Management practices in some ways are more objective and verifiable than measuring the environmental costs of a project where numerous assumptions might need to be taken into account and combining the two in a standard appeared to be difficult. This is perhaps where more general frameworks that collated many standards together, such as the UN PRI provided value to the exercise. Generally speaking, the project rating tools erred on the side of metrics focused on management practices by the companies involved in projects and the portfolio-oriented accounting tools primarily focused on performance indicators.

In carrying out this study it is clear to see that there are a large number of sustainability standard systems on offer to the industry. There is thus concern that the wide array of tools and standards available will incentivize more institutional investors and large allocators of capital to take a “wait and see” approach to the meaningful adoption of sustainability standards in their infrastructure investments. Even the pioneering members of the industry on the topic have not coalesced around an industry standard as they try different tools and models. Rather, they are mirroring the decisions of standard designers, and adapting their approach to the local context of the decision at hand. This review indicates that infrastructure will likely remain a difficult asset class to commoditize, for sustainability reporting and otherwise. This is not to devalue the efforts or usefulness of the sustainability standards thus far. These are excellent steps towards aligning the infrastructure investment community around a common language of reporting and set of international performance metrics. As the metric and reporting industry continues to develop in the sector, those specific indicators and metrics that emerge as international standards will enable wider adoption by more diversified investors.

A key question at the outset of this study was whether a consensus was forming within the infrastructure investment sector around a common set of standards the industry could use to evaluate and report on the sustainability of projects, in order promote their adoption. This would enable key drivers of adoption – institutional investors and public sector project sponsors – to encourage downstream participants in the value chain to adopt some of the standards included in this study. That international consensus is not, at least in the near term, occurring, but that does not necessarily preclude the increased adoption of sustainability assessments by the industry. Several developments could better enable upstream members of the value chain to promote sustainability standards even as the specific metrics and tools to do so continue to evolve and increase.

The initiative cited above to develop higher-order metrics that can be gleaned from across the different assessment tools is one such development. Another would be the creation of a “clearing house” of tools and accounting metrics available to investors for different sectors, regulatory regimes and purposes. This would be another step in enabling upstream members of the infrastructure value chain to promote better evaluation and reporting of sustainability performance while empowering their service providers and asset managers to tailor their assessments to the local context of the projects they invest in.

Both of those initiatives would help upstream members of the infrastructure value chain push for more sustainable infrastructure projects, but further research could also help drive adoption downstream. During the interviews conducted to support this study, practitioners consistently highlighted the need to demonstrate the value of sustainability to the managers, engineers and contractors developing and operating projects on the ground. Demonstrating that more sustainable design processes and management practices will improve financial performance and reduce risk in the long-term is critical to engendering support for these programs. Future research can help here as well, particularly in the study of outcomes for projects that implement sustainable

management practices through the tools and metrics included in this study. Sustainability and resilience are no longer just the concerns of future generations; they can have a material impact on the economic performance and risk profile of individual projects. The performance of projects that proactively address and measure sustainability will be an important opportunity for future research in this field. This is particularly relevant given the long-term nature of infrastructure as an investment asset class and the theoretically long-term investors that should be attracted to it.

The purpose of the project was to provide an overview of the different standards that have been developed for the infrastructure investment sector. While certain elements of environmental performance were included in the assessments, an extension to this study would be to appraise in more detail the higher order performance indicators for relevant aspects such as biodiversity resilience, ecosystems, species, water use, runoff and GHG emissions to name a few. Future work could further study the effectiveness of various standards in addressing and incorporating science-based sustainability impacts.

References

- Berardi, U., 2012. Sustainability assessment in construction sector: rating systems and rated buildings. *Sustainable Development*, pp. 411-424.
- Bocchini, P., Frangopol, D. M., Ummenhofer, T. & Zinke, T., 2014. Resilience and Sustainability of Civil Infrastructure: Toward a Unified Approach. *Journal of Infrastructure Systems*.
- Brodie, S. et al., 2013. A Review of Sustainability Rating Systems for Transportation and Neighborhood-Level Developments. *Green Streets, Highways, and Development*, pp. 337-354.
- Callan Institute, 2018. *2018 ESG Survey*, s.l.: Callan Institute.
- Cambridge Associates, 2017. *The Financial Performance of Real Assets Impact Investments*, Boston: Cambridge Associates.
- CDC, 2018. *ESG Toolkit for Fund Managers - Infrastructure*. [Online]
Available at: <https://toolkit.cdcgroup.com/sector-profiles/infrastructure>
- CEEQUAL, 2010. *Assessment Manual for Projects in the UK and Ireland Version 4.1*, s.l.: CEEQUAL.
- CEEQUAL, 2015. *CEEQUAL Scheme Description CEEQUAL for Projects and Term Contracts Version 5.2*, s.l.: CEEQUAL.
- Chew, M. Y. & Das, S., 2007. Building grading systems: a review of the state-of-art. *Architectural Science Review*, pp. 3-13.
- Clark, M. & Mangieri, C., 2017. *Quantifying a Sustainable Return on Investment*. s.l., ASCE, pp. 314-322.
- Diaz-Sarachaga, J. M., Jato-Espino, D., Alsulami, B. & Castro-Fresno, D., 2016. Evaluation of existing sustainable infrastructure rating systems for their application in developing countries. *Ecological Indicators*, pp. 491-502.
- Fenner, R. & Ryce, T., 2008. A comparative analysis of two building rating systems, part I: evaluation. *Engineering Sustainability*, pp. 55-63.
- Foxon, T. J. et al., 1999. Useful indicators of urban sustainability: some methodological issues. *Local Environment*, pp. 137-149.
- GIB, 2017. *Your Guide to Certification under SuRe - the Standard for Sustainable and Resilient Infrastructure*, Basel: Global Infrastructure Basel.
- GIB, 2018. *SuRe Standard*, Basel: Global Infrastructure Basel.
- GRESB, 2016. *GRESB Infrastructure Asset Assessment*, s.l.: GRESB.
- GRESB, 2016. *GRESB Infrastructure Fund Assessment*, s.l.: GRESB.
- GRESB, 2016. *GRESB Infrastructure Reference Guide*, s.l.: GRESB.
- GRESB, 2017. *2017 GRESB Results*, s.l.: GRESB.

- Gupta, R., Morris, J. W. F. & Espinoza, R. D., 2016. Financial Sustainability as a Metric for Infrastructure Projects. *Geo-Chicago*, pp. 653-662.
- Hiremath, R. B. et al., 2013. Indicator-based urban sustainability - A review. *Energy for Sustainable Development*, pp. 555-563.
- IFC, 2012. *IFC Performance Standards on Environmental and Social Sustainability*, Washington DC: IFC, World Bank Group.
- IFC, 2018. *IFC Performance Standards*. [Online]
Available at: https://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/Sustainability-At-IFC/Policies-Standards/Performance-Standards
- Inter-American Development Bank, 2018. *A Framework to Guide Sustainability Across the Project Cycle*, s.l.: IDB Invest.
- ISCA, 2018. *Impacts Report 2018*, s.l.: Infrastructure Sustainability Council of Australia.
- ISCA, 2018. *Infrastructure Sustainability Council of Australia*. [Online]
Available at: <https://www.isca.org.au/>
[Accessed July 2018].
- ISCA, 2018. *Infrastructure Sustainability Scorecard - Design and As Built v2.0*. s.l.: Infrastructure Sustainability Council of Australia.
- ISI, 2015. *Envision Rating System for Sustainable Infrastructure*, Washington D.C.: Institute for Sustainable Infrastructure.
- ISI, 2018. *Envision V3: What You Need to Know & Frequently Asked Questions*, Washington D.C.: Institute for Sustainable Infrastructure.
- Levett, R., 1998. Sustainability indicators - integrating quality of life and environmental protection. *Journal of Royal Statistical Society*, pp. 406-410.
- Loucks, D., Stakhiv, E. Z. & Martin, L. R., 2000. Sustainable water resources management. *Journal of Water Resources Planning and Management*, pp. 43-47.
- Lynch, A. L. et al., 2011. *Sustainable Urban Development Indicators for the United States*, Philadelphia: Penn Instituted for Urban Research.
- Minsker, B. et al., 2015. Progress and Recommendations for Advancing Performance-Based Sustainable and Resilient Infrastructure Design. *Journal of Water Resources Planning and Management*.
- Morgan Stanley, 2018. *Sustainable Signals: Asset Owners Embrace Sustainability*, New York: Morgan Stanley.
- Mudaliar, A. P. A. B. R. D. H., 2017. *The State of Impact Measurement and Management Practice*, s.l.: GIIN.
- PRI, 2018. *Principles for Responsible Investment*. [Online]
Available at: <https://www.unpri.org/>

- Protocol, G., 2018. *Greenhouse Gas Protocol*. [Online]
Available at: <https://ghgprotocol.org/>
- Sahely, H. R., Kennedy, C. A. & Adams, B. J., 2005. Developing sustainability criteria for urban infrastructure systems. *Canadian Journal of Civil Engineering*, pp. 72-85.
- SASB, 2018. *Sustainability and Accounting Standards Board*. [Online]
Available at: <https://www.sasb.org/>
- Serebrisky, T. et al., 2018. *IDBG Framework for Planning, Preparing, and Financing Sustainable Infrastructure Projects*, s.l.: IDB Sustainable Infrastructure Platform.
- Sheesley, E., Whitaker, B., Wray, M. & Klekotka, J., 2014. *Envision Case Study: Seaport Dolphin Berth Improvements*. s.l., ASCE, pp. 690-700.
- Sierra, L. A., Pellicer, E. & Yepes, V., 2017. Method for estimating the social sustainability of infrastructure projects. *Environmental Impact Assessment Review*, pp. 41-53.
- Siew, R. Y., Balatbat, M. C. & Carmichael, D. G., 2013. A review of building/infrastructure sustainability reporting tools (SRTs). *Smart and Sustainable Built Environment*, pp. 106-139.
- Ugwu, O. O. & Haupt, T. C., 2007. Key performance indicators and assessment methods for infrastructure sustainability - a South African construction industry perspective. *Building and Environment*, pp. 665-680.
- WCED, 1987. *Our common future*, Oxford: World Commission on Environment and Development (WCED).
- WRI, W., 2004. *GHG Protocol. A Corporate Accounting and Reporting Standard.*, s.l.: s.n.

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