

Impact Assessment and Measurement with Sustainable Development Goals

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Abstract

With the rapid growth of sustainable and responsible investment and widespread adoption of the environmental, social, and governance (ESG) reporting and integration by organizations, how to assess and measure ESG impact has become a critical issue. Although the UN's Sustainable Development Goals (SDGs) provide a useful framework for investors and organizations globally to align their standards, the SDGs are vague on how to implement them at an organizational or activity level. Current practice relies heavily on third-party ESG rating providers, whose scores mostly apply to public equities only. They also suffer from biases, inconsistencies, and a lack of sufficient disclosure. Impact measurement is an alternative that grew out of impact investing that extends beyond public equities and circumvents many of the drawbacks of ESG ratings. However, despite its increasing popularity, impact measurement is still in its infancy and lacks standards that can be generalized across various business activities. In this chapter, we propose a new framework for impact assessment and measurement, leveraging our practical experience working with industry leaders from Singapore (DBS Bank) and the Netherlands (Impact Institute). Our framework focuses on quantifying, valuing, and aggregating the different kinds of impact - direct vs. indirect, absolute vs. marginal - for different stakeholders, and is highly implementable. It also helps organizations map the impact from their activities on various stakeholders to different SDGs, thereby providing a generalizable approach for organizations across sectors and countries. We define our conceptual framework and illustrate how it may be applied with a case study on measuring the impact of bank loans to the palm-oil and automotive sectors.

Keywords: ESG Ratings, Sustainable Development Goals, SDGs, Impact Assessment, Impact Measurement, Impact Valuation, Impact Institute, DBS Bank

Impact Assessment and Measurement with Sustainable Development Goals

1. Introduction

Understanding how to measure and assess the environmental, social, and governance (ESG) impact of investments is increasingly important, with the growth of sustainable, responsible, and impact (SRI) investing. As trillions of dollars are invested based on firms' ESG performance and impact,¹ the reliability of ESG and impact measures and proper disclosure of ESG-related information are of foremost importance to investors, managers and policymakers.

The United Nations Sustainable Development Goals (UN SDGs), one of the most commonly adopted ESG and impact-assessment frameworks, are based on a broad consensus of global stakeholders around 17 ambitious goals. Though responsibility for achieving the SDGs rests primarily with the countries that have adopted them, government initiatives alone are not enough to lead to goal achievement by their target date of 2030. Meanwhile, policymakers and the development community have looked to various ESG investment opportunities and vehicles to help them channel capital in ways that may advance sustainable development around the world by 2030. Understanding how to integrate the SDGs into ESG reporting, ratings and measurement will help funders and corporations identify and prioritize their SDG targets, set objectives, and measure and report their progress.

Investors and corporations widely agree that impact measurement is central to building support for SDG investments. Increasingly, investors want to have more detailed social and

¹ For example, some experts believe that achievement of the SDGs by all nations would open up an estimated US\$12 trillion in four economic systems — food and agriculture, cities, energy and materials, and health and well-being — as a result of new opportunities and efficiency gains. See: Business and Sustainable Development Commission report “Better Business, Better World” (2017): <https://sustainabledevelopment.un.org/content/documents/2399BetterBusinessBetterWorld.pdf>.

environmental performance data to improve their understanding of non-financial returns on investments and re-allocate capital accordingly. Unfortunately, impact assessment and measurement remain a challenge for virtually all investors, and the challenge lies in defining “impact” (OECD, 2019). According to the World Bank Council for Sustainable Development (WBCSD), “investors are not getting the sustainability information they want or need to make informed decisions. Reasons for this include the fact that there’s too much information across conflicting frameworks and that there are differing definitions for what sustainability is and does from company to company. Plus, investors have difficulty assessing to what extent the information can be relied on.” (WBCSD, 2018)

Besides the issues identified by the OECD and WBCSD, we suggest that there are several other reasons why current impact assessment and management practices are inadequate to guide SDG investments. First, most ESG ratings measure inputs or output, but not outcomes or the impact of operations and investments. Second, while many different ESG rating providers publish metrics, these metrics, in general, are not comparable across the providers. Third, ESG ratings are subject to biases and inconsistencies. How ESG performance is assessed and compared remains largely a black box. Fourth, impact measurement is different from, and often beyond, ESG ratings. While ESG ratings are usually given assigned to public equities, and increasingly fixed income, little is known about the ESG impact of private companies, start-ups and small projects. There lacks a clear, consistent theoretical guidance for measuring the impact for different businesses and investments. There also lacks a concrete framework of mapping the ESG impact to the UN SDGs as well as the welfare of specific stakeholder groups. For some SDGs such as #11 (Sustainable Cities and Communities) and #14 (Life Below Water), ESG metrics have not yet been comprehensively developed. Current ESG metrics are thus not fully encompassing all the SDGs.

In this paper, we present a new framework for impact assessment and measurement based on our experience working with a bank in Singapore and a social enterprise in the Netherlands, which circumvents some of the shortcomings of current ESG rating practices. Our approach relies on quantitative methodologies to conduct an outcome- and impact-based analysis. Our approach draws data from academic research across various fields and applies integrated profit & loss (IP&L) analysis to measure the monetizable impact on capital for all stakeholders. It also draws on our experience working with industry practitioners on monetizing the environmental and social impact of investments on different stakeholders. With our measurement framework, we hope to improve the impact data and methodologies currently used by academics and practitioners.

We would like to stress that impact measurement and valuation are still in their infant stage, with limited research and guidelines. In this context, our framework represents a first attempt to provide a plausible schema to measure and value impact, rather than a comprehensive and conclusive solution. Hence, this paper can be viewed as a “call for research” for the further development of more objective, transparent and generalizable impact-measurement methodologies that are better aligned with the UN SDGs.

Section 2 of our paper lays out the context and identifies major challenges in impact assessment and measurement. Section 3 reviews the literature on ESG ratings, reporting and impact measurement. Section 4 delineates our proposed impact-measurement framework. Section 5 discusses further research agenda and presents our conclusions.

2. SDGs, ESG Ratings and Reporting, and Impact Measurement

2.1 *The Zoo of ESG Ratings*

As the UN SDGs gain broader adoption, many corporations and investors have begun to use them as a road map to align their investment focus with the long-term sustainability goals of society. Generally, they rely on ESG data generated by their in-house research or external parties. Externally provided ESG data is available from ESG rating agencies that collect and aggregate a range of information on a company's ESG performance: its own disclosures, third-party reports (such as from NGOs), media releases and proprietary research through company interviews and questionnaires. The rating agencies then come up with an overall ESG score, as well as scores for the individual components of E, S, and G. ESG ratings are mostly given to publicly listed equities included in major global equity indices. They are industry-adjusted (for example, only comparing the ESG performance of companies within the same business sector), and are based on different methodologies. Some widely used ratings are created by KLD (now called MSCI ESG STAT, with over 3,000 US companies), MSCI Intangible Value Assessment (now MSCI ESG, with over 7,500 global companies), Thomson Reuters ASSET4 ESG (now Refinitiv ESG, with over 7,000 global companies), Sustainalytics Company Ratings (with over 11,000 global companies), Dow Jones Sustainability Index (RobecoSAM), FTSE4Good, ISS ESG (Ethix), Oekom Corporate Ratings, GES International, Vigeo Eiris, S&P ESG Index and Trucost (including data from the Carbon Disclosure Project), Bloomberg, Morningstar, FTSE Russell and Vigeo Eiris, among others. Some ESG raters such as S&P Global additionally provide ratings on a company's SDG alignment based on its current strategies and actions.

However, many have biases in their ESG ratings, including biases based on: (1) size (larger companies may receive better ESG reviews because they can dedicate more resources to

preparing and publishing ESG disclosures, and controlling reputational risks); (2) geography (higher ESG assessments may be given to companies domiciled in regions with higher reporting requirements); and (3) industry (normalizing ESG ratings by industry can lead to oversimplifications). Another issue is that ESG ratings may be retrospective and fail to capture a company's prospective attempts to improve its sustainability record.²

For example, according to a recent article in *The Economist*, ESG ratings are usually poorly correlated with one another, which differentiates them from credit ratings. In other words, ESG rating firms disagree about which companies are good or bad (Economist, December 7, 2019). This finding is corroborated by *Financial Times*, which finds that the correlations between two major ESG rating firms MSCI and Sustainalytics is only 0.32. In contrast, the correlation for credit ratings is usually above 0.9 (Financial Times, July 28, 2018). Regarding non-disclosure, *Financial Times* also finds that this is usually penalized by raters. For example, electric-vehicle maker, Tesla, is rated worse than firms that make gas guzzlers in FTSE Russell ESG ratings. As bigger firms are better able to afford disclosure, they tend to generate better ESG scores (Economist, December 7, 2019). These inconsistencies and biases call for greater transparency and standards in ESG reporting and measurement.

2.2 ESG Reporting

As an important input for ESG measurement is corporations' own ESG reporting, there has been an emerging trend of sustainability reporting by companies, which is the disclosure and communication of ESG goals as well as the company's progress towards them.

² For example, a controversial stock today might not be so tomorrow – incumbent energy firms may be fossil-fuel heavy but could be best positioned to explore alternative energies in the future.

A sustainability or ESG report should be the key platform for communicating sustainability performance and impact, whether positive or negative. More than just being a chronicle based on collected data, it can instead be a method to internalize and improve an organization's commitment to sustainable development in a way that can be demonstrated to both internal and external stakeholders. SDG #12 (Responsible Consumption and Production), Target 12.6 specifically encourages companies to adopt sustainable practices and sustainability reporting.

A key issue in sustainability reporting is whether and how much data on ESG practices and impact should be disclosed. This issue is closely related to the "materiality" principle of reporting, which is about the significance and relevance of the reported information to report users. The materiality principle controls whether a publicly traded corporation must disclose certain information. Information is said to be material if omitting or misstating it can influence the decisions that users make based on the corporation's reports. The principle works as a filter to the data: let material information in, keep the immaterial out. In this way, the materiality approach focuses only on "material information" and "key areas" of non-financial/ESG information. This has proven to be an effective reform to the stakeholder approach. Still, given the qualitative nature and difficulties of defining tolerable errors for non-financial information, judging which sustainability issues are material remains a difficult task.

Nevertheless, several major frameworks for sustainability reporting have been developed. They include the Global Reporting Initiative (GRI), International Integrated Reporting Committee (IIRC), Sustainability Accounting Standards Board (SASB) and Task Force on Climate-Related Financial Disclosures (TCFD). These frameworks aim to identify information for inclusion in an integrated report for use in assessing an organization's ability to create value. For example, IIRC defines the "six capitals" of financial capital, manufactured capital,

intellectual capital, human capital, natural capital, and social and relationship capital. It aims to reflect the integrated thinking of the whole value-creation process, and facilitate more efficient and productive allocation of capital, by encouraging integrated profit & loss and sustainability reporting practices in public corporations. However, they usually do not set quality or performance benchmarks against the organization's past years' records or against its peers. In addition, they do not prescribe firm-specific KPIs. (Most sustainability reports are aligned to GRI, SASB and TCFD reporting standards on the required KPIs but are not specific to the firms per se.) Moreover, measurement methods and the disclosure of individual matters usually vary across the different reporting standards, making it onerous for investors and management to assess the real impact reported by firms.

2.3 Impact Investing and Impact Measurement

In the past decade, impact investing by investors who seek both financial returns and positive social impact has grown by leaps and bounds.³ According to the Global Impact Investing Network (GIIN), over 1,700 investors managed US\$715 billion of impact investment assets as of April 2020. This was more than triple the estimated US\$228 billion in 2018, and more than six times the estimated US\$114 billion in 2017. Meanwhile, the commitment of nearly 200 countries to mobilize green finance under the 2015 Paris Agreement on climate change has helped to catalyze the global green bond market, which had itself grown to US\$521 billion by September 2019, from a mere US\$600 million in 2007 when the first green bonds were issued.

According to the GIIN report, many impact investors have shown that their social and environmental goals are aligned with the SDGs. A handful of impact investors have begun to

³ See O'Donohoe, Leijonhufvud, and Saltuk (2010) and Cole, Gandhi and Brumme (2018) for an introduction to impact investing.

create products, raise capital and make new investments that directly target progress towards the SDGs. Going beyond aligning and retroactively mapping the impact to the SDGs, these investors proactively target and incorporate the SDGs at various stages of the investment cycle, making them the central focus (Pineiro, Dithrich, Dhar, 2018). Traditionally, impact investing is usually the domain of private-equity investors due to their long-term focus and holding of significant stakes in businesses. With the prevalence of SDGs, all kinds of capital providers – banks, development financial institutions, pension funds, family offices, endowments, foundations, and corporations – now actively pursue impact investing.

An important part of impact investing is active impact measurement. Investors in this space are usually concerned about how to report the social and environmental impact of their investments on the basis of transparency and accountability. Different from traditional ESG investing which is about investing in public equities based on ESG ratings, impact investing is usually applied to private equity, fixed-income securities, real assets and projects, for which ESG ratings are not available. Therefore, properly defining the scope of impact measurement that can be used to compare across asset classes is imperative. According to GIIN, the scope of impact measurement includes: (1) setting goals and expectations; (2) defining impact strategies and searching for evidence; (3) selecting metrics and setting targets; and (4) measuring, tracking, using data and reporting. Various impact measurement methods have also been developed, such as the expected return (or social return on investment) method, theory of change method, mission alignment method and experimental or quasi-experimental method. In the following sections, we will review the pros and cons of these methods and compare them with the traditional ESG ratings. We then propose our impact measurement framework which seeks to circumvent some of the problems with the current methodologies.

3. Literature Review

With regard to ESG measurement, the various rating agencies diverge substantially on a company's ESG performance. The correlation between ESG ratings across different providers is about 0.3. This contrasts with credit ratings, where the correlation between the ratings of S&P and Moody's is around 0.99.⁴ Chatterji, Durand, Levine, Touboul (2016) document the surprising lack of agreement across social ratings from six well-established raters, even after adjusting for differences in the definition of corporate social responsibility (CSR) used by the raters. This casts doubts on the ratings' validity. The authors attribute the divergence to a lack of common standards on which aspects of CSR factors to be included, and lack of consensus on measuring metrics. Berg, Koelbel and Rigobon (2019) dived deeper into the source of the divergence by decomposing ESG rating discrepancies into scope, measurement and weights. "Measurement" divergence (namely, raters measure the same ESG attribute with different indicators⁵) explains 53% of the overall divergence. About 44% of the divergence is due to scope (different raters include different attributes)⁶ and 3% is due to differing weights (different raters place different weights on the individual components of the overall score). Surprisingly, there is even disagreement on objective facts that can be verified from public records. For example, an indicator for whether or a company is a member of the UN Global Compact, which should be perfectly correlated, only has a correlation of 0.86 across the rating agencies. The authors also detect a strong "rater effect" (namely, the rating agencies'

⁴ See blog post by Alex Edmans: <https://www.growthepie.net/the-inconsistency-of-esg-ratings/>

⁵ For example, labor practices could be evaluated on the basis of workforce turnover, or the number of labor cases against the firm; female friendliness could be measured by the gender pay gap, the percentage of women on the board, or the percentage of women in the workforce.

⁶ For example, most raters consider a firm's greenhouse gas emissions when evaluating its environmental record, but only some will include electromagnetic radiation; and one rating agency may include lobbying while another might not.

assessments in individual categories seem to be influenced by their views of the analyzed company as a whole).

The above rating discrepancies were also observed by Gibson, Krueger, Riand and Schmidt (2019) for S&P 500 firms by using ESG scores from six prominent data providers (Thomson Reuters, MSCI, Sustainalytics, KLD, Bloomberg and Inrate) over the period 2013 to 2017. The average correlation in the overall ESG ratings of the six providers amounted to less than 50%. Gibson et al. also found that the geographical location of the ESG data providers affected the raters' perspectives on ESG: civil-law-based ESG data providers stress the role of labor issues and social protection, while those located in common-law countries emphasize investor protection, shareholders' rights and other traditional corporate governance issues. Finally, Kotsantonis and Serafeim (2019) point to inconsistencies in how rating providers report data, how they define peer groups and how they impute ESG data.

With regard to impact investing and impact measurement, some academic and practice-oriented studies have been emerging. Using fund-level data, Barber, Morse and Yasuda (2019) examined impact funds around the world and found that venture capital impact funds earn lower returns than traditional funds. The reason that investors are still investing in impact funds is that they derive non-pecuniary utility from such dual-objective funds. This is especially the case in Europe, which dominates the demand for impact funds. Geczy, Jeffers, Musto and Tucker (2019) document that most impact funds tie the compensation of their fund managers to traditional financial incentives, with few relating compensation to impact. Others explore the theoretical underpinnings of how impact investing can affect firm behavior and partially internalize externalities, such as Chowdhry, Davies and Waters (2019) and Oehmke and Opp (2019), but the topic generally remains under-researched.

Addy, Chorenge, Collins, Etzel (2019) have proposed a framework for calculating the value of impact investing and also a new metric, namely the *impact multiple of money* (IMM). IMM involves: (1) assessing the relevance and scale of a product, a service or a project that is under evaluation; (2) identifying target social or environmental outcomes; (3) estimating the economic value of those outcomes to society; (4) adjusting for risks; (5) estimating terminal value; and (6) calculating social returns on every dollar spent.

Other frameworks for impact measurement have been devised. For example, the Equator Principles (EPs) were developed by the World Bank's International Financial Corporation (IFC) as a risk-management framework for determining, assessing and managing environmental and social risks. The EPs apply to all industry sectors globally and four financial products: (1) project finance advisory services; (2) project finance; (3) project-related corporate loans; and (4) bridge loans. They are primarily intended to provide a minimum standard for due diligence and monitoring to support risk management.⁷ The IFC also reviewed several impact-measurement frameworks in its recent report (IFC, 2019). Notably, a monetization framework has been developed by TPG's RISE Fund, which is based on the calculation of an IMM in the spirit of Addy et al. (2019) that quantifies and monetizes an investment's net social and environmental impact.

Harvard Business School has launched an Impact Weighted Accounts project since 2019.⁸ Impact-weighted accounts are line items on a financial statement, such as an income statement or a balance sheet, which are added to supplement the statement of financial health and

⁷ EPs include ten principles: 1. Review and Categorisation; 2. Environmental and Social Assessment; 3. Applicable Environmental and Social Standards; 4. Environmental and Social Management System and Equator Principles Action Plan; 5. Stakeholder Engagement; 6. Grievance Mechanism; 7. Independent Review; 8. Covenants; 9. Independent Monitoring and Reporting; and 10. Reporting and Transparency

⁸ See: https://www.hbs.edu/impact-weighted-accounts/Documents/Impact-Weighted-Accounts-Report-2019_preview.pdf.

performance by reflecting a company's positive and negative impact on various stakeholders. Central to impact-weighted accounts is the monetary valuation of the social and environmental impact. The aim of such monetization is to: (1) translate all types of social and environmental impact into comparable units that business managers and investors can intuitively understand; (2) aggregate these units meaningfully such that they can be compared without obscuring important details needed for decision-making; and (3) show the financial and impact performance in the same accounts that are compatible to existing financial and business analysis tools. The project is ongoing. To date, more than 56 companies have experimented with monetary impact valuation, producing environmental or total profit and loss accounts. About 86% of them measure the environmental impact, 50% estimate the employment/social impact and 20% estimate the product impact.

As for ESG disclosure and sustainability reporting, Christensen, Hail and Leuz (2019) offer a comprehensive literature review of the accounting and finance research. They find substantial variation in ESG disclosures across firms, which makes an objective comparison of ESG practices difficult. They argue that increased quantity and quality of ESG information can generate benefits to capital markets through greater liquidity, lower cost of capital and better capital allocation. Information related to CSR can be useful to investors in estimating future cash flows or assessing firm risks (Dhaliwal, Li, Tsang, and Yang, 2011; Dhaliwal, Radhakrishnan, Tsang, and Yang, 2012; Grewal, Hauptmann, and Serafeim, 2019), as such information is often closely related to a firm's normal business activities.

However, ESG disclosure requirements can also introduce proprietary and potential litigation costs. For example, Grewal, Riedl, and Serafeim (2020) document that equity markets reacted negatively to the passage of an EU Directive mandating increased non-financial (E&S) disclosure in 2014. The negative market reaction was weaker for firms with higher pre-

Directive ESG performance and disclosure levels. Likewise, for China, Chen, Hung, and Wang (2017) document that mandatory CSR disclosure alters firm behavior and generates externalities at the expense of shareholders. Mandatory ESG reporting can induce difficulties in terms of the ESG standard-setting process, the materiality of ESG disclosures, the use of boilerplate language, and enforcement challenges. Khan, Serafeim and Yoon (2016) also mapped CSR materiality guidance from the SASB to ESG scores and found that firms with high materiality ESG scores outperformed firms with low materiality scores.

4. New Framework for Impact Assessment and Measurement

4.1 Conceptual Framework and Model

We propose a new framework for impact assessment and measurement which fits into the SDG framework and other impact frameworks such as the Triple Bottom Line or Safe and Just Operating Space. We leveraged our experience working with one of the premier banks in Asia on measuring the impact of its lending to the palm-oil and automotive sectors. Our methodology draws extensively from the one developed by Impact Institute, a social enterprise based in Amsterdam that specializes in impact assessment and valuation.

First, we wish to highlight the differences between ESG measurement and impact measurement. ESG measurement is typically applied to public equities, usually of index stocks. ESG reporting is usually output- or input-focused. It uses different metrics for the E, S and G dimensions. It is usually provided by third-party agencies and used for portfolio construction by asset owners/managers. In contrast, impact measurement is applicable to a wide variety of asset classes, not only public equities but also private equity, projects, debt, real assets, etc. It is not about intention or output but effects or outcomes. The impact can be quantified, valued, and aggregated and includes direct impact and indirect impact. There are usually no standard

metrics and no rating agency to provide the impact measurement. Table 1 below summarizes these key differences.

Table 1: Differences between ESG Measurement and Impact Measurement

ESG Measurement	Impact Measurement	SDG Alignment
<ul style="list-style-type: none"> • Public equities, usually of index stocks • Reporting usually focuses on output or inputs • Uses different metrics for E, S, G dimensions • Usually provided by third-party agencies • Used for portfolio construction by asset owners/managers 	<ul style="list-style-type: none"> • Public equities, private equity, projects, debt, real assets • Not about intention or output, but effects or outcomes • Can be quantified, valued, and aggregated • Direct & indirect impact • Absolute & marginal impact • Usually no standard metrics and no rating agencies 	<ul style="list-style-type: none"> • Some SDGs are to be achieved through private equity, projects, social impact/sustainability-linked bonds (for example, #1, #4, #9, #10) • Most SDGs are about outcomes (as they are goals) rather than intentions • SDG alignment requires metrics and valuation that can be directly compared • As SDGs are grand challenges, they require measuring both the direct and indirect impact on various stakeholders, and require reference scenarios

Second, we suggest that to differentiate between absolute impact and marginal impact, as impact measurement usually relies on counterfactual thinking (namely, measuring impact based on the reference scenario). An impact is absolute if it is derived using a “no alternative reference” scenario in an “impact pathway” (a logic model of how an organization’s activities create various impact on different stakeholders at different stages of its operations) and is marginal if it is derived using an alternative reference scenario. In this regard, a marginal impact is just as important as absolute impact, as the two measure impact based on different - and equally important - scenarios.

The scope of impact also depends on whether it is made through the organization in scope. Therefore, we differentiate between direct impact and indirect impact. An impact is direct if it is created directly by the operations of the organization in scope and is indirect if it is created by other organizations' operations. An indirect impact can also occur along an organization's value chain. For example, providing funding to a manufacturing company not only causes its own carbon emissions to increase, but also the emissions in its supply chain by its customers and suppliers.

The above classification creates a two-by-two matrix as shown in Figure 1.⁹

		<i>Type of reference scenario</i>	
		Absolute impact	Marginal impact
<i>Organizational activity in scope</i>	Direct impact	Direct absolute impact	Direct marginal impact
	Indirect impact	Indirect absolute impact	Indirect marginal impact

Figure 1. Different Types of Impact

These different types of impact can then be quantified, valued, and aggregated based on widely used databases and academic findings. For example, the negative impact of carbon emissions can be valued using carbon trading prices, which reflect the monetary values of remediating climate change. The positive impact of employment can be valued by calculating the direct salary payments to workers as well as increases in their lifetime income arising from additional years of schooling for their children. As these different types of impact can all be measured in monetary units based on databases and academic literature, they can be aggregated as well.

⁹ The figure is modified from Integrated Profit & Loss Assessment Methodology (IAM): Supplement Impact Contribution (Figure 1: Four types of impact), compiled by Impact Institute.

To calculate the overall impact in monetary terms, one can use a formula that incorporates these two dimensions of impact to measure the impact on a specific stakeholder group. An organizational activity in scope can have four types of impact on each stakeholder, and the weight of each type of impact varies with the nature of the stakeholder relationship, as shown in the following formula:¹⁰

Impact contribution

$$\begin{aligned}
 &= \alpha[\gamma \times \text{Direct absolute impact} \\
 &+ (1 - \gamma) \times \delta \times \text{Indirect absolute impact}] \\
 &+ \beta[\gamma \times \text{Direct marginal impact} + (1 \\
 &- \gamma) \times \delta \times \text{Indirect marginal impact}]
 \end{aligned}$$

where α and β are parameters that capture the weights that one assigns to absolute impact and marginal impact. For example, one may assume that the absolute and marginal impact of a factory on the local environment (natural capital) is 50% and 50%, respectively. γ is the weight/probability of the direct impact and $(1 - \gamma)$ is the probability of indirect impact (as impact is either direct or indirect, the two weights sum up to 1). δ denotes the extent to which the indirect impact should be attributed to the organization in scope (namely, the degree of responsibility of the organization).

Third, the above impact measurement, valuation and aggregation can be used to measure the ESG impact for each type of stakeholder and across stakeholders. There are several ways of defining stakeholders. For example, the “six capitals” classified by IIRC – financial capital, manufactured capital, intellectual capital, natural capital, social and relationship capital, and

¹⁰ This formula borrows from the “Integrated Profit & Loss Assessment Methodology” developed by Impact Institute, with whom we worked on two pilot studies in the DBS impact measurement project. More details of the project can be found in Section 4.2.

human capital – provide a good conceptual framework. These six capitals aim to comprehensively capture the costs and benefits for different stakeholders. In addition, stakeholder impact can be assessed based on the SDG goal that an activity contributes to. For example, an investment that helps to increase local employment can potentially contribute to SDG #1 (No Poverty), SDG #2 (Zero Hunger) and SDG #8 (Decent Work and Economic Growth). An organizational activity that creates high volumes of carbon emissions can negatively contribute to SDG #13 (Climate Action), whereas an environmental R&D spending that aims to provide cleaner and cheaper energy for production and consumption can positively contribute to SDG #7 (Affordable and Clean Energy), SDG #12 (Responsible Consumption and Production) and SDG #13 (Climate Action). In addition, the UN has set up measures for each of the 17 SDGs and offers tools to track their progress.¹¹ These help organizations and investors monitor the alignment of their impact measurements with the SDGs.

Fourth, impact is usually expressed through welfare, which is measured by wellbeing or respect of rights. This can be positive or negative. It can be made explicit through impact valuation, which is to assign a monetary value to an impact. To this end, we take a stakeholder's perspective and suggest the attribution of impact for different stakeholders based on their economic claims (for example, income for employees, taxation for government). As impact valuation usually relies on both publicly available and proprietary data, it is important to build a database that includes macro- and micro-level impact data, especially on monetization factors. For example, with regard to employee income, average wage data can be obtained from ILOSTAT, living wage benchmark data can be obtained from WageIndicator and data on mean to median wage ratios can be obtained from OECDstat. Similarly, environmental impact factors

¹¹ See: <https://sdg-tracker.org/>.

can be obtained from the ReCiPe Impact Assessment method, CDP and TCFD, which set facility- and firm-level reporting standards for climate-change impact. Environmental monetization factors can be obtained from the CE Delft Environmental Prices Handbook. Information on inflation, exchange rate, purchasing power parity and other macro-level financial data can be retrieved from the World Bank.

A conceptual framework for our impact measurement approach is illustrated in Figure 2. It depicts the scope of an organization or an activity for impact measurement (corporations, NGOs, projects, real assets, investments etc.), the types of impact to be assessed (similar to Table 1), the key inputs required to measure, quantify, value and aggregate impact (for example, databases on macro- and micro-level impact factors, monetization factors and financial factors, and integrated P&L or impact weighted accounts approach) as well as the stakeholder groups for which the impact will be measured (six capitals) and the domain that each capital/stakeholder belongs to. These capitals can be further mapped to specific SDGs, depending on the reporting organization's targets. In Section 4.2, we present a case study of DBS Bank in Singapore to show how this framework can be applied for impact measurement and management.

[Insert Figure 2 about Here]

4.2 Case Study: Impact Measurement and Management at DBS Bank

DBS Bank in Singapore is a pioneer in actively measuring and managing impact in the region. An early mover in integrated reporting – it has been adopting integrated reporting for years, the bank has encountered difficulties in quantifying and valuing externalities created in its lending practices. Thus, it is highly aware of the need to accurately measure and monetise various impact along its value chain to inform its lending decisions. With the assistance of

Impact Institute, the bank has taken a holistic perspective on all its stakeholders to analyse impact attributions to various stakeholders as well as its attributable impact as a lender in two pilot studies.

The magnitude of the impact on the various stakeholders that the bank lent to is linked to their economic claims. Specifically, the selling prices of products to consumers and their willingness to pay; the salaries, training and development expenses to employees and their human capital; (quantity of) pollution and donations to the community; dividends to shareholders; and taxation by regulators. The share of direct impact attributed to the bank as another important stakeholder (creditor) can be captured by its lending interest rates.

For example, its loans to the palm-oil sector in Indonesia may create a negative environmental impact through polluting and deforestation activities in palm-oil manufacturing. However they may also create a positive social impact by increasing local employment, paying salaries to workers, and contributing to governmental taxation. The absolute impact of the DBS loan to the plantation is measured by comparing it with a scenario of no bank loan at all for the plantation. Its marginal impact is measured by comparing the DBS loan to a scenario of the plantation receiving loans from another bank. A direct impact may be an increase in the household income of a worker at the plantation through his or her salaries, while an indirect impact may be welfare improvement for the worker's children from more years of schooling with the help of such salary payment. Its loans may also cause the palm-oil plantation to use child labor on site (direct impact) as well as induce child labor at its suppliers and subcontractors (indirect impact). These all represent the negative impact on human capital.

Based on impact measurement, valuation and aggregation, the bank realised that the negative environmental impact (deforestation and biodiversity losses) is approximately equal to the

positive impact from the creation of manufactured capital (manufactured goods from palm oil for consumers) and human capital (for employees). The bank has a “No Deforestation, No Peat, No Exploitation” (NDPE) lending policy for its palm-oil clients. Based on current levels of NDPE implementation in the industry, its lending policy has the potential to reduce the overall negative impact from its lending by 14% as compared to plantations that do not adopt NDPE. Where NDPE is optimally implemented, the negative impact from lending to plantations can be reduced by up to 49%. In both cases, the reduction of negative impact can be traced to a reduction in contributions to climate change (by avoiding peatland degradation and deforestation) and child labour.

The bank also analysed total impact as well as the portion attributed to itself from lending to manufacturers making electric vehicles (EVs) and combustion engine vehicles (CEVs), using the industry averages of all manufacturers in both the sub-sectors. Employing a similar approach, the bank looks at the impact throughout the entire manufacturing process, from raw materials, mining and component production to assembly and consumer use.

The quantitative analysis concludes that transitioning from CEV to EV investment has a net positive impact and improves externalities – by approximately 40% for environmental externalities (such as a reduction in emissions from eliminating the use of fossil fuels in the consumer use phase) and by approximately 20% for social externalities (such as a reduction in occupational health and safety risks). It is worthwhile to note that while EVs have overall reduced the environmental impact, the environmental impact generated during the production phase from the mining of materials and electricity use contributes to a greater negative impact than the same phase for CEVs. The study consistently highlighted that the energy mix used for powering EVs is a key determinant of environmental impact. This highlights the

interdependencies between sectors and the need to pursue a low-carbon transition through all industries to reduce the negative environmental impact effectively.

Such impact measurement also helps DBS map its activities to SDG goals. For example, lending to the palm-oil sector in Indonesia positively contributes to SDG #1 (No Poverty), #2 (Zero Hunger) and potentially #4 (Quality Education) through the indirect impact on workers' families, but contributes negatively to SDG #13 (Climate Action), #15 (Life on Land) and potentially #8 (Decent Work and Economic Growth) and #16 (Peace and Justice) through using child labor. This impact measurement framework helps the bank better understand the overall ESG impact (along with financial impact) of its lending policies on various stakeholders and better identify how its business contributes to SDGs.

5. Future Research Agenda

There is no denying that the UN's SDGs have created and will continue to create many opportunities for both investors and corporations. Some have described the SDGs as “the ‘lingua franca’ of policy makers and other stakeholders,”¹² as they provide a framework and common language for companies and investors to integrate sustainability information into their reporting, management and investment decisions. The SDGs have also catalyzed a plethora of sustainable, responsible and impact-investment opportunities and mobilized trillions of dollars of capital around the world. Many external organizations have proposed ESG ratings and measurement frameworks. However, to date, there has been little consensus on how ESG impact should be measured and assessed consistently across the asset classes, projects and countries. There also remains a mismatch between the SDG targets and impact-measurement

¹² <http://www.ng.undp.org/content/nigeria/en/home/presscenter/speeches/2017/11/21/meeting-the-sdgs-promise-will-depend-on-public-private-and-civil-society-partnerships.html>.

practices, leaving a gap in ESG impact communication to investors, corporations, policy makers and various stakeholders. Incorporating the SDGs into impact measurement through a more holistic stakeholders' perspective and in a way that is consistent with traditional financial reporting and measurement is central to adapting to the new global sustainability agenda.

Steadily improving impact data will allow investors to better monitor, manage and communicate their contributions to selected SDGs and motivate greater capital investment. Companies can also benefit directly from impact measurement – those able to show that their business has a real impact may be more successful in attracting investment capital. In addition, third-party ESG raters can rely on quantified and monetized impact data to fine-tune their ESG ratings. This will extend the scope of ESG ratings from public equities to broader asset classes, and facilitate the comparison and aggregation of individual E, S and G impact.

Our paper is a call for future research in several important areas. First, we believe research should go beyond simply analyzing the challenges with current ESG rating practices (Chatterji et al., 2016; Berg et al., 2019; Gibson et al., 2019) to developing more robust approaches to navigate these challenges. Researchers should look beyond ESG measurement for public equities to other asset classes and not only measure them in their natural units (tonnes, square meters) or percentile ranking but in monetary terms such that the impact can be valued and aggregated. Second, more research work is needed to extend the scope of impact measurement, which is largely limited to impact investing at this moment and is usually not guided by theory and academic research. We suggest that researchers and practitioners adopt a more theory- and research-based approach by linking impact contributions to statistics and findings in leading policy databases (for example, ILOSTAT, World Bank) and academic research. This will make impact assessment and measurement more objective and generalizable, and helps organizations better identify the right counterfactual reference scenarios. This is especially important when

measuring indirect impact, such as the impact along the supply chain. Third, we welcome scholars and practitioners to collaborate and further develop our impact measurement and assessment framework and improve the accuracy of its mapping to the SDG targets (currently 17 SDGs and 169 targets). Such efforts can be supported by the tools and trackers that map the progress made by the UN. When evaluating how business activities, organisations, innovations or investments impact the SDGs, one can better understand the opportunities and difficulties of implementing the SDGs. This will facilitate the alignment of impact management with organizations' and investors' pursuit of certain SDG targets. Overall, impact measurement is still nascent but holds great potential not only for investment but also research that can better guide capital allocation for organizations and the economy.

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Table 2. Acronyms Used in the Chapter

Acronym	Full Name
ESG	Environmental, Social and Governance
CSR	Corporate Social Responsibility
SDG	Sustainable Development Goal
OECD	Organisation for Economic Co-operation and Development
WBCSD	World Bank Council for Sustainable Development
IP&L	Integrated Profit & Loss
NGO	Non-governmental organization
GRI	Global Reporting Initiative
CDP	Carbon Disclosure Project
IIRC	International Integrated Reporting Committee
SASB	Sustainability Accounting Standards Board
TCFD	Taskforce on Climate-Related Financial Disclosure
GIIN	Global Impact Investing Network
KPI	Key performance indicator
PPP	Purchasing power parity
IMM	Impact multiple of money (it also refers to impact measurement & management in other contexts)
IFC	International Financial Corporation
NDPE	No Deforestation, No Peat, No Exploitation
EV	Electric vehicle
CEV	Combustion engine vehicle

Figure 2. A Conceptual Framework for Impact Measurement

