

Article

The Relationship between Investor Materiality and the Sustainable Development Goals: A Methodological Framework

Gianni Betti ¹, Costanza Consolandi ^{2,*} and Robert G. Eccles ³

¹ Department of Economics and Statistics, University of Siena, 53100 Siena, Italy; gianni.betti@unisi.it

² Department of Business and Law, University of Siena, 53100 Siena, Italy

³ Said Business School, University of Oxford, Oxford OX1 1HP, UK; robert.eccles@sbs.ox.ac.uk

* Correspondence: costanza.consolandi@unisi.it; Tel.: +39-0577-2324099

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Abstract: The world has great expectations for how the private sector, both companies and investors, can support the 17 Sustainable Development Goals (SDGs). In fact, it is generally believed that these goals cannot be achieved without strong support from the private sector. But will making the world a better place hurt financial returns? The answer is “No” if companies focus on the SDGs and their associated targets that benefit from strong performance on the material environmental, social, and governance (ESG) issues that matter to investors. In this paper we map the 30 generic ESG issues identified by the Sustainability Accounting Standards Board (SASB) to the SDGs and their targets. We show that some SASB issues are more material for a given SDG than others. We also show that some SASB issues are more important to the SDGs in general than others. We also map the material ESG issues for each of SASB’s 79 industries to the SDGs and to their targets. For each sector, there are particular SDGs where it has high impact and for each SDG there are particular sectors that have a high impact on it, and some sectors are more important to the SDGs in aggregate than others. The same is true at the target level. This mapping can be used as a guide for both companies and investors who want to understand how value-creating ESG performance can contribute to the SDGs. This paper is divided into four parts. Part I explains the motivation for this study. Part II explains our methodology and Part III the results. Part IV concludes with a summary of our results and some reflections on how our mapping methodology can be improved.

Keywords: sustainability; Sustainable Development Goals; SDG; materiality; financial performance; impact; Sustainability Accounting Standard Board; SASB

1. Introduction

The 17 Sustainable Development Goals (SDGs), ratified by the United Nations on 15 September 2015, have been described as “the closest thing the Earth has to a strategy” [1]. It is also widely acknowledged that the goals set for 2030 cannot be achieved by the public sector alone. Indeed, the greater burden falls on the private sector with estimates that it will have to close the funding gap of \$2.5 trillion per year and to ensure that the private sector provides the expected 50% of the total \$115 trillion cost of funding the SDGs [2]. Fortunately, the investment community is increasingly seeing the SDGs as creating investment opportunities and corporations are looking for the business opportunities they create. The current discussion on the role of the private sector in the achievement of the goals is intense [3–5], especially at the institutional level. In May 2018, the European Commission, on the basis of the Recommendations of the High-Level Expert Group on Sustainable Finance [6], adopted a package of measures that set out a comprehensive strategy to connect finance to sustainability

through reorienting capital flows towards sustainable investments, managing financial risk connected to climate change, social issues and environmental degradation and fostering long-termism in financial and economic activities [7]. Besides measures on SDG implementations at a country level, such as the SDG Index and Dashboard of UN Sustainable Development Solutions Network (UN-SDSN), in order to track progress towards the goals and their associated 169 targets at a company level, a large number of tools and “business indicators” have been proposed. The World Business Council for Sustainable Development (WBCSD) together with Global Reporting Initiative (GRI) and the UN Global Compact (Global Compact) have created SDG Compass, a guide with associated tools and knowledge resources to help companies align their business strategies with the SDGs and to measuring and managing their contribution, including an inventory that maps more than 1500 existing business indicators against the 17 SDGs and their respective 169 targets. GRI and the Global Compact have also published a document [8] to help companies understand the SDGs and their targets. Also, consulting firms such as EY, KPMG, and PricewaterhouseCoopers have developed their own tools to help companies interested in understanding how their strategies can support the SDGs. The SDGs are about “impact”, and in these measures the unit of analysis is not the company, but something outside of the company whose operations affect it, such as reduced gender inequality in a community or replenishment of fishing stocks. However, many of the metrics are about a company’s operations and the impact must be inferred or further calculated, often based on data that lies outside the company’s control. On this topic, Vörösmarty et al. [9] propose a new approach to evaluate corporate products and services within broader environmental or human beneficiary settings, but true impact measurement is still at an early stage of development. Ideally, an impact measure can be linked to actions in order to show differences, both positive and negative, had the action not taken place. In this paper, we present a framework which will enable investors and companies to contribute to the SDGs by identifying the material ESG issues (what investors care about) by sector that also contribute to the SDGs (what the world cares about). Within the broader framework of the performance implications of sustainability investments [10–14] and starting from the evidence of how ESG materiality positively affects financial performance [15,16], we aim at providing a new framing able to answer to the long-standing question of “Can a company do well by doing good?” In particular, will contributing to the SDGs be good for a company’s financial performance or will creating these positive externalities actually hurt financial performance? The somewhat unsatisfying but honest answer is “It depends.” Our thesis is that good performance on ESG issues which are material from the perspective of the Sustainability Accounting Standards Board (SASB) but which also have impact on one or more SDGs will be a situation where doing good means doing well.

We chose SASB’s framework as the basis for mapping to the SDGs for two reasons. First, it is focused on investors, not multiple stakeholders, which is the case for the SDGs. This captures the tension companies feel in trying to be responsive to both audiences. Second, it is the only framework that has identified the material ESG issues at the sector and industry level. This is essential since which of the 30 generic ESG issues are material varies substantially by industry.

2. Methodology

The concept of materiality we adopt in this paper is the one used by SASB that was established to identify the material ESG issues at an industry level that are financially relevant for investors, as they affect financial performance [17]. SASB is a San Francisco-based nonprofit organization established in 2011. SASB’s mission is to develop measurement standards for reporting on material environmental, social, and governance (ESG) issues—often called “non-financial information”—that are of the same relevance and reliability as accounting standards for financial information. Because the materiality of sustainability issues varies across industries [18], SASB has established the Sustainable Industry Classification System™ [19] (SICS) comprised of 10 sectors subdivided into 79 industries. Companies are grouped in terms of similar resource intensity, as well as sustainability risks and opportunities.

Industry working groups comprised of companies, investors, and industry experts of various kinds work to identify the material issues for each industry and the appropriate key performance indicator for measuring and reporting on them. It has issued a set of provisional standards for which it has received public comment and is now working on incorporating this feedback into them. Following Phadke and DeMates [20], we started with a mapping of SASB's 30 generic ESG issues organized in terms of the categories of environment, social capital, human capital, business model and innovation, and leadership and governance to the SDGs. In our analysis, we didn't consider SDG 17 since this is an overarching one covering all SDGs. Furthermore, as it is intuitive that different issues might have a different degree of impact on the SDGs, we increased the detail of our analysis by mapping SASB's 30 generic ESG issues to the target level for each SDG. Table 1 describes the 17 SDGs and Table 2 presents the description of the targets of SDG 8 as an example.

Table 1. The UN Sustainable Development Goals.

SDG	Description
SDG 1	End poverty in all its forms everywhere
SDG 2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
SDG 3	Ensure healthy lives and promote wellbeing for all at all ages
SDG 4	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
SDG 5	Achieve gender equality and empower all women and girls
SDG 6	Ensure availability and sustainable management of water and sanitation for all
SDG 7	Ensure access to affordable reliable sustainable and modern energy for all
SDG 8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
SDG 9	Build resilient infrastructure promote inclusive and sustainable industrialization and foster innovation
SDG 10	Reduce inequality within and among countries
SDG 11	Make cities and human settlements inclusive, safe, resilient and sustainable
SDG 12	Ensure sustainable consumption and production patterns
SDG 13	Take urgent action to combat climate change and impacts
SDG 14	Conserve and sustainably use the oceans seas and marine resources for sustainable development
SDG 15	Protect restore and promote sustainable use of terrestrial ecosystems sustainably manage forests combat desertification and halt and reverse land degradation and halt biodiversity loss
SDG 16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective accountable and inclusive institutions at all levels
SDG 17	Strengthen the means of implementation and revitalize the global partnership for sustainable development

Table 2. Targets of SDG 8.

SDG 8 Targets	Description
8.1	Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries
8.2	Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labor-intensive sectors
8.3	Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services
8.4	Improve progressively, through 2030, global resource efficiency in consumption and production and endeavor to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programs on sustainable consumption and production, with developed countries taking the lead

Table 2. Cont.

SDG 8 Targets	Description
8.5	By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value
8.6	By 2020, substantially reduce the proportion of youth not in employment, education or training
8.7	Take immediate and effective measures to eradicate forced labor, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of child labor, including recruitment and use of child soldiers, and by 2025 end child labor in all its forms
8.8	Protect labor rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment
8.9	By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products
8.1	Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all
8.a	Increase Aid for Trade support for developing countries, in particular least developed countries, including through the Enhanced Integrated Framework for Trade-Related Technical Assistance to Least Developed Countries
8.b	By 2020, develop and operationalize a global strategy for youth employment and implement the Global Jobs Pact of the International Labour Organization

These mappings represent the basis of our framework as they allowed us to calculate two different sets of indices (both at a goal and a target level):

- a set of indices that measure the ability of SASB's issues to impact the SDGs and the relevance of SASB's issues to the SDGs;
- a set of indices that measure the ability of each industry and each sector to impact the SDGs.

Moreover, mapping at the target level allowed us to calculate, for each of the abovementioned sets, secondary indices that measure the intensity of impact on a given SDG of each SASB's issue. In our analysis, we considered 107 targets. The 169 targets also include *means of implementation* targets to facilitate outcomes. SDG17, which covers global partnership, comprises 19 such targets, and there is a total of 43 more under SDGs 1–16 (where they are separately identified using small letters after the goal number, e.g., 16.b: Promote and enforce non-discriminatory laws and policies for sustainable development) [21]. Target selection is shown in Table 3.

Table 3. SDG targets in the analysis.

Original SDG targets:	169
Less: targets of SDG 17:	19
Less: "resources" targets:	43
Number of targets included in the analysis:	107

For the first group of indices, at a goal level for each SASB issue i (i : 1 to 30) we identified the number (G) of SDG(s) impacted; in other words, a generic SDG j could be impacted ($imp_{i,j} = 1$) and a generic SDG l could not be ($imp_{i,l} = 0$). We then calculated for each SASB issue the *SDG Relevance Index (SRI)* as the ratio between the number of SDGs impacted by a specific material issue to the total number—16—of SDGs:

$$SRI_i = \frac{\sum_{j=1}^{16} imp_{i,j}}{16}. \quad (1)$$

At a target level, for each SASB issue i (i : 1 to 30) we identified the number (T_j) of targets impacted in a specific SDG j ; in other words, a generic target t in SDG j (t : 1 to T_j) could be impacted ($imp_{i,j,t} = 1$) and a generic target s in the same SDG j could be not ($imp_{i,j,s} = 0$).

We then computed for each SASB issue the *Target Relevance Index (TRI)* as the ratio between the number of targets impacted by a specific material issue on the total number of targets, that shows the ability of each SASB's issue to impact targets. This could be written by generalizing Equation (1), in the following way:

$$TRI_i = \frac{\sum_{j=1}^{16} \sum_{t=1}^{T_j} imp_{i,j,t}}{107}. \quad (2)$$

To measure the intensity of impact on a given SDG of each issue, for each SASB issue and for each SDG_{*j*} we calculated, as a secondary index, the *Target Specific Relevance Index (TSRI)*. If a SASB issue *i* impacts on a generic SDG_{*j*} (i.e., $imp_{i,j} = 1$), then the TSRI is the ratio between the number of SDG_{*j*} targets impacted by a specific material issue to the total number of targets of SDG_{*j*}. The TSRI is defined as:

$$TSRI_{i,j} = \frac{\sum_{t=1}^{T_j} imp_{i,j,t}}{T_j}. \quad (3)$$

By symmetry with the previous step, we also look at the number of SASB's generic ESG issues that impact each of the SDGs (*MI*) and calculate an *ESG Relevance Index (ERI)* for each SDG *j* to measure the extent to which the SDG is impacted by the 30 SASB issues:

$$ERI_j = \frac{\sum_{i=1}^{30} imp_{j,i}}{30} = \frac{MI}{30}. \quad (4)$$

At target level, to measure the extent to which the single target is impacted by the 30 SASB's issues, we looked at the number of SASB's issues affecting each target and calculated an *ESG Target Relevance Index (TERI)*:

$$TERI_j = \frac{\sum_{i=1}^{30} imp_{j,i}}{30}. \quad (5)$$

In this case, as a secondary index for each SDG we calculated an *ESG Target Specific Relevance Index (TSERI)* averaging the *TERIs* related to each SDG:

$$TSERI_{i,j} = \frac{\sum_{i=1}^{T_j} TERI_j}{T_j}. \quad (6)$$

However, we should add a caveat to this first set of measures. Our proposal is based simply on counts of various kinds. It does not take into account the fact that a material SASB issue in one sector could be more important than another due to the absolute value of the topic (for example, the total amount of GHG emissions is likely to vary across sectors). If we had a credible weighting scheme, we could propose a more refined methodology based on fuzzy set theory, and the results could be different. We make an attempt to present such advanced methodology later in this paper in Section 4. This same caveat applies to our analysis at the target level. From a company perspective, and investors in the company, the critical question is which SDGs are impacted by the material ESG issues determined by SASB for its industry and how a focus on ESG material issues can contribute to the SDGs; we calculated a second set of indices that provide a measure of the ability of each industry and sector to impact the SDGs. For each SDG_{*j*} and for each industry n_k (n_k : 1 to N_k) in a given sector *k* (*k*: 1 to 10), we counted the number of industry-specific material issues impacting the SDG (MI_k) and calculated the *SDG Industry Impact Index (ISII)* as the ratio (multiplied by 100) between the number of industry-specific material issues and the total number of SASB general ESG issues (above defined as *MI*) affecting the single SDG *j*; in the formula:

$$ISII_{j,n_k} = \frac{\sum_{i=1}^{30} imp_{j,i,n_k}}{\sum_{i=1}^{30} imp_{j,i}} 100 = \frac{MI_k}{MI} 100. \quad (7)$$

At the target level, for each industry n_k (n_k : 1 to N_k) in a given sector k (k : 1 to 10), we counted the number of industry-specific material issues impacting each target t_j in each SDG j (TMI_k) and for each target we calculate the *Industry Target Impact Index* ($ITII$) as the ratio (multiplied by 100) between TMI_k and the total number of SASB general ESG issues (defines as TMI) affecting the single target t_j in SDG $_j$; in formula:

$$ITII_{j,T_j,n_k} = \frac{\sum_{i=1}^{30} imp_{j,T_j,i,n_k}}{\sum_{i=1}^{30} imp_{j,T_j,i}} 100 = \frac{TMI_k}{TMI} 100. \quad (8)$$

Also, in this case, as a secondary index, for each SDG we calculated an *Industry SDG Target Impact Index* ($ISTII$), as the ratio (multiplied by 100) between the sum over targets in SDG j of the number of industry-specific material issues impacting each target t_j in each SDG (TMI_k), and the sum over targets in SDG $_j$ of the total number of SASB general ESG issues affecting the single Target t_j in SDG j ; in formula:

$$ISTII_{j,n_k} = \frac{\sum_{t=1}^{T_j} \sum_{i=1}^{30} imp_{j,T_j,i,n_k}}{\sum_{t=1}^{T_j} \sum_{i=1}^{30} imp_{j,T_j,i}} 100. \quad (9)$$

At a sector level k and at a goal level, the *Sector SDG Impact Index* was computed averaging the single $ISII$ s:

$$SSII_{j,k} = \frac{\sum_{n_k=1}^{N_k} ISII_{j,n_k}}{N_k}. \quad (10)$$

At a target level, for each sector k , the target t_j in SDG j Impact Index ($STII$) was computed averaging the single $ITII$ s:

$$STII_{j,T_j,k} = \frac{\sum_{n_k=1}^{N_k} ITII_{j,T_j,n_k}}{N_k}. \quad (11)$$

The corresponding secondary index, for each sector k , is the *Sector SDG Target Impact Index* ($SSTII$), computed averaging the single $ISTII$ s:

$$SSTII_{j,k} = \frac{\sum_{n_k=1}^{N_k} ISTII_{j,n_k}}{N_k}. \quad (12)$$

An *Average SDG Impact Index* was finally computed both at industry ($AISII$) and sector ($ASSII$) level, averaging the $ISII$ s and $SSII$ s, respectively:

$$AISII_{n_k} = \frac{\sum_{j=1}^{16} ISII_{j,n_k}}{16}, \quad (13)$$

$$ASSII_{n_k} = \frac{\sum_{j=1}^{16} SSII_{j,n_k}}{16}. \quad (14)$$

An *Average SDG Target Impact Index* was finally computed both at the industry ($AISTII$) and sector ($ASSTII$) level, averaging the single $ITII$ s and $SSTII$ s:

$$AISTII_{n_k} = \frac{\sum_{j=1}^{16} \sum_{t=1}^{T_j} \sum_{i=1}^{30} imp_{j,T_j,i,n_k}}{\sum_{j=1}^{16} \sum_{t=1}^{T_j} \sum_{i=1}^{30} imp_{j,T_j,i}} 100, \quad (15)$$

$$ASSTII_{n_k} = \frac{\sum_{j=1}^{16} \sum_{t=1}^{T_j} \sum_{i=1}^{30} imp_{j,T_j,i,n_k}}{\sum_{j=1}^{16} \sum_{t=1}^{T_j} \sum_{i=1}^{30} imp_{j,T_j,i}} 100. \quad (16)$$

A synthesis of the calculated indices is presented in Table 4.

Table 4. Definitions of the calculated indices *.

SDG Mapping					Target Mapping				
Acronym	Full name	Measured for	Description	Number of Related Formula	Acronym	Full name	Measured for	Description	Number of Related Formula
SRI	SDG relevance Index	Each SASB's issue	Number of SDG impacted by each SASB's issue/16	(1)	TRI	Target Relevance Index	Each SASB's issues	Number of targets the SDGs impacted by each SASB's issues /107	(2)
					<i>TSRI</i>	<i>Target Specific Relevance Index</i>	<i>Each SDG impacted by each SASB's issues</i>	<i>Number of targets impacted in the single SDG / total number of targets in the SDG</i>	(3)
ERI	ESG Relevance Index	Each SDG	Number of SASB's issue impacting the SDG/30	(4)	TERI	ESG Target Relevance Index	Each target	Number of SASB's issue impacting the target/30	(5)
					<i>TSERI</i>	<i>Target Specific ESG Relevance Index</i>	<i>Each SDG</i>	<i>Average of the single TERIs</i>	(6)
ISII	Industry SDG Impact Index	Each SDG in each industry	Ratio (multiplied by 100) between the number of industry-specific material issues impacting the SDG and the total number of SASB issues impacting the SDG	(7)	ITII	Industry Target Impact Index	Each target in each industry	Ratio (multiplied by 100) between the number of industry specific material issues impacting the target on the total number of SASB issues impacting the target	(8)
					<i>ISTII</i>	<i>Industry SDG Target Impact Index</i>	<i>Each SDG and in each industry</i>	<i>Ratio (multiplied by 100) between the number of industry specific material issues impacting each target in each SDG and the total number of SASB general ESG issues affecting the single Target tj in SDG j</i>	(9)
SSII	Sector SDG Impact Index	Each SDG in each sector	Average of ISII across industries in the sector	(10)	STII	Sector Target Impact Index	Each target in each sector	Average of ITII across industries in the sector	(11)
					<i>SSTII</i>	<i>Sector SDG Target Impact Index</i>	<i>Each SDG in each sector</i>	<i>Average of the ISTII across industries in the sector</i>	(12)
AISII	Average Industry SDG Impact Index	All SDGs in each industry	Average of ISII of all SDGs	(13)	AISTII	Average Industry SDG Target Index	All SDGs in each industry	Average of the ISTII	(14)
ASSII	Average Sector SDG Impact Index	All SDGs in each Sector	Average of SSII of all SDGs	(15)	ASSTII	Average Sector SDG Target Index	All SDGs in each sector	Average of the SSTII	(16)

* The secondary indices are in italics.

3. Results and Discussion

3.1. The SDG Relevance Indices and the ESG Relevance Indices

Table 5 presents the values of the SDG Relevance Indices obtained mapping SASB sustainability issues to the SDGs both at a goal (SRI) and a target (TRI) level defined by (1) and (2) in the methodology section, respectively.

Table 5. SDG Relevance Index (SRI) and Target Relevance Index (TRI).

SASB General Issue Category	# of SDGs Impacted	#of Targets Impacted	SRI	TRI
Environment				
GHG emissions	3	4	18.75%	3.74%
Air quality	3	7	18.75%	6.54%
Energy management	5	13	31.25%	12.15%
Fuel management	4	11	25.00%	10.28%
Water and wastewater management	7	24	43.75%	22.43%
Waste and hazardous materials management	7	20	43.75%	18.69%
Biodiversity impacts	6	17	37.50%	15.89%
Social Capital				
Human rights and community relations	6	24	37.50%	22.43%
Access and affordability	9	18	56.25%	16.82%
Customer welfare	5	12	31.25%	11.21%
Data security and customer privacy	1	1	6.25%	0.93%
Fair disclosure and labeling	4	8	25.00%	7.48%
Fair marketing and advertising	4	10	25.00%	9.35%
Human Capital				
Labor relations	4	16	25.00%	14.95%
Fair labor practices	7	18	43.75%	16.82%
Employee health safety and wellbeing	3	13	18.75%	12.15%
Diversity and inclusion	4	17	25.00%	15.89%
Compensation and benefits	3	8	18.75%	7.48%
Recruitment development and retention	5	14	31.25%	13.08%
Business Model and Innovation				
Lifecycle impacts of products and services	11	27	68.75%	25.23%
Environmental social impacts on assets & operations		19	56.25%	17.76%
Product packaging	6	10	37.50%	9.35%
Product quality and safety	4	9	25.00%	8.41%
Leadership and Governance				
Systemic risk management	5	7	31.25%	6.54%
Accident and safety management	7	13	43.75%	12.15%
Business ethics and transparency of payments	1	2	6.25%	1.87%
Competitive behavior	4	9	25.00%	8.41%
Regulatory capture and political influence	5	12	31.25%	11.21%
Materials sourcing	8	17	50.00%	15.89%
Supply chain management	14	36	87.50%	33.64%

We can observe a substantial variation in the ability of the SASB issues to impact the SDGs. On a goal level, the SRI ranges from 6.3% to 87.5% with a mean of 34.2% and a standard deviation of 17%; business ethics and transparency of payments and data security and privacy are only relevant to SDG 16 (peace, justice and strong institutions) whereas supply chain management impacts 14 of the SDGs (the exceptions are SDG 2 on ending hunger, and SDG 4 on inclusive and equitable quality

education). This shows that some SASB issues are much important to the SDGs in terms of scope than others but also that the SASB issues are in general relevant to the SDGs.

At a target level, values of the TRI range from 0.93% to 33.64% with an average value of 12.95% and a standard deviation of 7%; data security and privacy is relevant only for target 16.4 (by 2030, significantly reduce illicit financial and arms flows, strengthen the recovery and return of stolen assets and combat all forms of organized crime) whereas supply chain management is relevant for 36 out of the 107 targets considered in our analysis.

When we consider the aggregate values for each SASB dimension, we find that business model and innovation present the highest values for both indices, with an SRI of 46.88% and a TRI of 15.98% (Table 6).

Table 6. SDG Relevance Index and Target Relevance Index for each SASB dimension.

	Environment	Social Capital	Human Capital	Business Model and Innovation	Leadership and Governance
SRI	31.25%	30.21%	27.08%	46.88%	39.29%
TRI	12.82%	11.37%	13.40%	15.19%	12.82%

The intensity of impact on a given SDG of each issue is provided by the Target Specific Relevance Index (TSRI), as defined in (3). Detailed results are reported in Table A1 in Appendix A. The TSRI ranges from 10% to 100% with a mean of 39.1% and a standard deviation of 21.4%. If on a goal level, our analysis shows that not all the SDGs are impacted by the same SASB issues, on a target level we can add that not all SASB issues that impact the same SDG do it with the same intensity. For example, SDG 7 (affordable and clean energy) has three targets. Supply chain management impacts all of them (100%), GHG emissions two of them (66.67%), and access and affordability only one of them (33.33%). In this regard, it is important to notice that the number of targets varies across the SDGs, ranging from three in SDG 7 and SDG 13 (climate action) to 10 in SDG 8 (decent work and economic growth) and SDG 16 (peace, justice and strong institutions).

The extent to which each SDG is impacted by the 30 SASB issues, is measured, at a goal level, by the *ESG Relevance Index (ERI)*, as defined in (4). Values of the ERI presented in Table 5 show that also for this index we have a variation similar to the SRI. The number of SASB issues impacting single SDG ranges from four for SDG 4 (quality education) to eighteen for SDG 3 (good health and well-being) and consequently the ERI ranges from 13% to 60% with a mean of 36%. This shows that, on a simple count basis, doing well on material issues will be more important for some SDGs than for others which suggests that the private sector can make more contributions to some SDGs than others.

At a target level, the corresponding index we calculated is the *Target ESG Relevance Index (TERI)*, defined in (5). Detailed values of the index are reported in Table A2 in the Appendix A. The *TERI* ranges from 46.7% for Target 3.9 (by 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination) to 0% for 17 targets not impacted by any SASB issue, with a mean of 12.65%, meaning that on average each target is impacted by less than four SASB's issues.

Averaging the TERIs across each SDG, as defined in (6), we calculated the *Target Specific ESG Relevance Index (TSERI)*. Table 7 shows that whereas on a goal level the SDG most impacted by SASB's issues is SDG 3 (good health and wellbeing, 60%), at a target level it is SDG 7 (affordable and clean energy, 26%). The *TSERI* ranges from 4% for SDG 4 (quality education) to 26% for SDG 7, with a mean of 12.95%.

Table 7. ESG Relevance Index (ERI) and Target Specific ESG Relevance Index (TSERI).

SDG	# of SASB's Issues Impacting the SDG	ERI	TSERI
SDG 1	11	37%	15%
SDG 2	10	33%	13%
SDG 3	18	60%	19%
SDG 4	4	13%	4%
SDG 5	7	23%	10%
SDG 6	13	43%	18%
SDG 7	10	33%	26%
SDG 8	14	47%	16%
SDG 9	9	30%	12%
SDG 10	10	33%	10%
SDG 11	10	33%	9%
SDG 12	15	50%	13%
SDG 13	9	30%	10%
SDG 14	9	27%	10%
SDG 15	8	40%	15%
SDG 16	11	37%	8%

3.2. The SDG Impact Indices and the Target Impact Indices

The second group of indices we created allows the assessment of the specific ability of the issues that are financially material for an industry. It is based on the assumption that the number of SDGs and targets impacted by all SASB issues represent the theoretical maximum effect that can be obtained by the private sector (i.e., the impact on SDGs that a theoretical company operating in a theoretical industry for which all the issues are material on a financial perspective might have). We therefore set this value equal to 100.

On the basis of SASB Materiality Map™ [22], we considered only the issues that are material for each industry in SASB's Sustainable Industry Classification System™ [19]. In essence, with different degrees of detail, the SDG Impact Index family measures the extent to which a company doing well on the material issues for its sector is doing good by contributing to each SDG.

At a goal level, the *Industry SDG Impact Index (ISII)*—defined by (7)—measures the ability of an industry to affect a given SDG through its material issues. In general, the ISIIs present noticeable variation and for each industry there is a particular SDG where it has high impact. It is too cumbersome to present all of the data since it would be a table of 79 (number of SASB industries) by 16 (number of SDGs). Table 8 illustrates this for the biotechnology industry with the highest score of 75.00 for SDG 4 (quality education) and the lowest of 36.36 for SDG 16 (peace, justice and strong institutions).

Table 8. Industry SDG Impact Index (ISII) for the biotechnology industry.

SDG	ISII	SDG	ISII
SDG4	75.00	SDG2	50.00
SDG11	60.00	SDG8	50.00
SDG5	57.14	SDG12	42.86
SDG14	57.14	SDG1	40.00
SDG3	55.56	SDG7	40.00
SDG9	55.56	SDG10	40.00
SDG15	54.55	SDG13	37.50
SDG6	53.85	SDG16	36.36

At a target level, the *Industry Target Impact Index (ITII)*, defined by (8), presents similar variations. Providing the data would be even more cumbersome, with a table of 79 by 107 (the number of targets). For illustration, Table 9 shows the data for the targets in SDG 8 (decent work and economic growth)

for the biotechnology industry, with the highest score of 100.00 for target 8.6 and the lowest of 0.00 for target 8.2 (see Table 2 for a description of the targets of SDG 8).

Table 9. Industry Target Impact Index (ITII) for the biotechnology industry.

Biotechnology Industry	
SDG 8 Targets	ITII
Target 8.6	100.00
Target 8.3	50.00
Target 8.5	50.00
Target 8.7	50.00
Target 8.8	50.00
Target 8.9	50.00
Target 8.4	42.86
Target 8.1	40.00
Target 8.2	0.00
Target 8.10	n.a. *

* None of SASB's issues impact target 8.10 and so the ITII cannot be calculated.

The target level mapping allowed us to calculate a target-weighted SDG impact index for each industry, the Industry *SDG Target Impact Index (ISTII)*, defined by (9). Again, using the biotechnology industry as example, values presented in Table 10 shows a similar variation to the previous index. Nevertheless, while SDG 4 remain the SDG most affected by the industry, SDG 13 (climate action) is in this case the goal with the lowest value.

Table 10. Industry SDG Target Impact Index (ISTII) for the Biotechnology Industry.

Biotechnology Industry			
SDG	ISTII	SDG	ISTII
SDG1	40.91	SDG2	60.00
SDG3	52.94	SDG4	87.50
SDG5	55.55	SDG6	66.66
SDG7	43.48	SDG8	45.83
SDG9	66.66	SDG10	50.00
SDG11	68.42	SDG12	54.83
SDG13	33.33	SDG14	65.00
SDG15	48.78	SDG16	43.47

At a sector level, averaging the industry SDG impact indices both at a goal and a target level, we calculated for each SDG (or each target) three other indices: the *Sector SDG Impact Index (SSII)*; the *Sector Target Impact Index (STII)*; and the *Sector SDG Target Impact Index (SSTII)*, respectively defined by (10), (11) and (12) formulas.

Using the health care Sector as an example, Table 11 shows the data for the targets in SDG 8, with a maximum of 33.33 also in this case for target 8.6 and a minimum value of 0.00 for target 8.2.

Values of *SSII*s and *SSTII*s are presented in Table 12. We can observe that for each sector there are particular SDGs where it has high impact (in bold in Table 12) and for each SDG there are particular sectors that have a high impact on it. At a goal level, SDG 4 is the goal where the highest number of sectors (four out of ten) presents the highest *SSII*, whereas at a target level (*SSTII*) this also applies to SDG 14 (life below water).

Table 11. Sector Target Impact Index (STII) for the health care sector.

Health Care Sector	
SDG 8 Targets	STII
Target 8.6	33.33
Target 8.4	30.95
Target 8.1	26.67
Target 8.9	25
Target 8.3	20.83
Target 8.5	20.83
Target 8.8	20.83
Target 8.7	16.67
Target 8.2	0
Target 8.10	n.a. *

* None of SASB's issues impact target 8.10 and so the STII cannot be calculated.

The last indices we calculated measure the ability of SASB industries and sectors to impact SDGs in general. These are represented by the *Average Industry SDG Impact Index (AISII)*, the *Average Sector SDG Impact Index (ASSII)* and the corresponding indices at a target level, *Average Industry SDG Target Impact Index (ASTII)* and the *Average Sector SDG Target Impact Index (ASSTII)*, described by formulas (13)–(16) in the Methodology section.

For reason of space, we do not present tabulated data of the above-mentioned indices at industry level. Using the industries in the health care sector as an example, the AISII ranges from 15.00 in the health care distribution industry to 50.34 for the biotechnology and pharmaceuticals industries, whereas the AISTII ranges from 13.79 in the managed care industry to 53.69 in the biotechnology and pharmaceutical industries, showing that some industries in the health care sector are more relevant to the SDGs than others. Indeed, this pattern is constant in all sectors, and the average standard deviation of the AISII is 15.31% whereas for the AISTII is equal to 17.27. Values are presented in Table 13.

Table 12. Sector SDG Impact Index (SSII) and Sector SDG Target Impact Index (STII).

Panel A: Sector SDG Impact Index (SSII)																
	<i>SDG</i> #1	<i>SDG</i> #2	<i>SDG</i> #3	<i>SDG</i> #4	<i>SDG</i> #5	<i>SDG</i> #6	<i>SDG</i> #7	<i>SDG</i> #8	<i>SDG</i> #9	<i>SDG</i> #10	<i>SDG</i> #11	<i>SDG</i> #12	<i>SDG</i> #13	<i>SDG</i> #14	<i>SDG</i> #15	<i>SDG</i> #16
HEALTHCARE	25.00	39.58	39.81	54.17	33.33	38.46	31.67	29.76	38.89	21.67	38.33	29.76	33.33	35.71	40.91	28.79
FINANCIALS	20.00	17.86	11.11	25.00	10.20	12.09	20.00	10.20	22.22	21.43	18.57	2.04	7.14	4.08	10.39	19.48
TECHNOLOGY & COMMUNICATION	11.67	8.33	20.37	12.50	30.95	19.23	26.67	23.81	35.19	25.00	21.67	22.62	25.00	26.19	21.21	27.27
NON- RENEWABLES RESOURCES	20.00	26.56	30.56	0.00	16.07	31.73	30.00	25.00	26.39	12.50	41.25	43.75	23.44	48.21	34.09	17.05
TRANSPORTATION	15.00	6.25	23.61	6.25	16.07	16.35	22.50	19.64	19.44	10.00	15.00	28.57	18.75	23.21	20.45	9.09
SERVICES	15.00	18.75	17.78	27.50	18.57	13.85	15.00	15.71	16.67	16.00	11.00	15.71	15.00	15.71	14.54	16.36
RESOURCE TRANSFORMATION	8.00	20.00	34.44	5.00	20.00	29.23	32.00	25.71	33.33	6.00	30.00	45.71	42.50	42.86	41.82	25.45
CONSUMPTION	16.00	33.33	30.00	33.33	26.66	27.18	23.33	20.95	23.70	14.67	18.67	32.38	38.33	31.43	36.36	23.03
RENEWABLE RESOURCES AND ALTERNATIVE ENERGIES	13.33	18.75	22.22	0.00	21.43	30.77	23.33	22.62	22.22	10.00	33.33	32.14	33.33	30.95	28.79	17.05
INFRASTRUCTURE	12.50	20.31	22.92	6.25	8.93	25.00	26.25	16.96	26.39	6.25	31.25	23.21	25.00	32.14	27.27	14.77
Panel B: Sector SDG Target Impact Index (STII)																
	<i>SDG</i> #1	<i>SDG</i> #2	<i>SDG</i> #3	<i>SDG</i> #4	<i>SDG</i> #5	<i>SDG</i> #6	<i>SDG</i> #7	<i>SDG</i> #8	<i>SDG</i> #9	<i>SDG</i> #10	<i>SDG</i> #11	<i>SDG</i> #12	<i>SDG</i> #13	<i>SDG</i> #14	<i>SDG</i> #15	<i>SDG</i> #16
HEALTHCARE	24.24	44.17	37.25	56.25	28.70	40.91	31.16	22.22	46.30	27.27	45.61	36.02	29.63	37.50	38.21	24.64
FINANCIALS	18.83	15.71	14.29	32.14	12.70	11.26	18.63	8.33	23.81	18.18	24.06	5.99	11.11	5.71	14.63	17.39
TECHNOLOGY & COMMUNICATION	19.70	18.33	19.93	12.50	34.26	22.73	28.99	26.04	34.26	26.52	23.68	27.96	22.22	30.00	21.95	18.12
NON- RENEWABLES RESOURCES	22.73	35.63	28.10	0.00	20.14	43.94	32.07	23.70	24.31	13.07	40.79	45.97	26.39	55.00	33.84	21.20
TRANSPORTATION	14.20	6.88	26.72	6.25	19.44	14.39	25.00	19.53	16.67	9.09	14.47	28.23	16.67	20.63	19.82	5.43
SERVICES	19.55	23.00	20.98	33.75	21.67	16.97	18.26	17.71	17.78	15.91	11.05	17.74	16.67	17.50	15.61	13.48
RESOURCE TRANSFORMATION	10.91	25.00	33.73	5.00	16.67	30.30	36.52	15.83	33.33	5.45	32.63	49.68	35.56	41.00	44.39	16.04
CONSUMPTION	21.52	36.67	30.72	37.50	24.07	28.08	29.28	18.61	27.78	15.45	17.54	35.27	35.56	34.67	36.42	14.78
RENEWABLE RESOURCES AND ALTERNATIVE ENERGIES	10.61	20.83	24.18	0.00	21.30	28.79	23.91	17.01	23.15	9.85	31.58	35.48	29.63	35.83	32.52	18.84
INFRASTRUCTURE	7.95	25.00	23.04	6.25	12.50	28.79	26.63	12.76	25.00	6.25	36.84	26.21	23.61	31.25	28.05	13.04

Table 13. Average Industry SDG Impact Index (AISII) and Average Industry SDG Target Impact Index (AISTII) for the health care sector.

Industry	AISII	AISTII
Biotechnology	50.34	53.69
Pharmaceuticals	50.34	53.69
Medical Equipment	45.60	45.57
Health Care Delivery	29.95	25.62
Health Care Distribution	15.00	14.29
Managed Care	18.46	13.79

Finally, in Table 14 are presented the values for the Average Sector SDG Impact Index (ASSII) and the Average Sector SDG Target Impact Index (ASSTII).

Table 14. Average Sector SDG Impact Index (ASSII) and Average Sector SDG Target Impact Index (ASSTII).

Sector	ASSII	ASSTII
HEALTHCARE	34.95	34.44
FINANCIALS	14.49	14.00
TECHNOLOGY & COMMUNICATION	22.35	24.22
NON- RENEWABLES RESOURCES	26.66	30.60
TRANSPORTATION	16.89	18.10
SERVICES	16.45	18.05
RESOURCE TRANSFORMATION	26.99	28.42
CONSUMPTION	26.84	27.37
RENEWABLE RESOURCES AND ALTERNATIVE ENERGIES	22.97	23.81
INFRASTRUCTURE	20.34	21.40

In both cases, health care is the sector that has the highest overall impact on the SDGs. This result is not surprising. Table 12 shows that this sector is among the four most important sectors for almost all the goals, followed by consumption, non-renewable resources and resource transformation. The lowest value both at a goal and a target level of the impact index for overall the SDGs is of the financial sector, that is (see Table 12) among the three most important sectors only for SDG 10 (reduced inequalities) when the index is calculated at a goal level and for SDG 1 (no poverty) and SDG 10 when the index is calculated at a target level. Nevertheless, it must be noticed that our framework takes into account only the direct relevance of a sector for SDGs. Indeed, the financial sector plays a crucial role on the achievement of the goals also through the “indirect” impact it can have (i.e., credit scoring based on SDG relevant issues, investment in companies/industries with high SDG impact, etc.). In general, adopting the SDGs as a unified framework for investment and credit policies, the financial sector can enhance the SDG relevance for all sectors. Let’s consider SDG 7 (affordable and clean energy) as example, for which the two most relevant sectors are non-renewable resources and resource transformation. In this case, the financial sector, besides through increasing energy efficiency of own buildings and operations, can contribute to reinforce the impact of the other sectors by financing projects in sustainable energy, through renovation loans, green loans, and structured finance.

4. Conclusions, Limitations and Further Research

In the introduction we noted the importance of the private sector in contributing to the achievement of the SDGs. Both the public and private sector need to understand the varying degrees to which the latter can support the former in achieving the SDGs. In the aggregate, the private sector will be more important to some SDGs, and their specific targets, than others. This paper provides specific guidance on how the private sector can support the SDGs by mapping the material issues that create value for shareholders to SDG targets that will make the world a better place. Our research

shows that for each sector, there are particular SDGs where it has high impact and for each SDG there are particular sectors that have a high impact on it, and some sectors are more important to the SDGs in aggregate than others. The same is true at the target level.

None of these findings are surprising since it would be expected that some sectors would be more relevant to a particular SDG than others. What perhaps is surprising is to see that a few sectors stand out in terms of their impact on the SDGs and that some SDGs are more impacted by SASB's ESG topics than others. The former means that the success of a few sectors will largely determine whether the SDG goals are met. The latter means that while some SDGs will substantially benefit from the private sector "doing well", others will benefit to a lesser extent.

As introduced in the methodology section, a limitation of the matching between SASB's material issues with the SDGs or their targets is its definition as a dichotomous variable (impact/not impact). It does not take into account the fact that a material SASB issue in one sector could be more important than another due to the absolute value of the topic. If we had a credible weighting scheme, the results could be different. This same caveat applies to our analysis at the target level. Another caveat is that we treat the impact of a material ESG issue as equal if it is relevant to an SDG. Just how important a material issue is to a SDG could vary according to its nature. For example, GHG emissions could be more important to achieving the success of some SDGs than others even though it has an impact on all of them. This too applies at the target level.

However, we believe that each material issue could impact a single SDG or target with a varying degree between 0 and 1; in this way, we can take into account fuzzy set theory (Zadeh, 1965) [23]. In the social sciences, fuzzy set theory has initially been adopted to study poverty and social exclusion [24,25]. Later, this methodology has been successfully implemented to monitor the effects of marital disruption on well-being [26], to measure the multidimensional education mismatch [27], to measure labor participation [28], and to study multidimensional measures of quality of life [29]. The positive results achieved while applying the fuzzy set approach to fields other than poverty demonstrate its wide applicability and robustness.

In the context of the matching between SASB material issues with the SDGs (or their targets), such varying degrees are defined as membership functions (m.f. = $\mu_{i,j}$) to the fuzzy set of impacted SGs. In other words, each SDG is impacted by a certain SASB material issue, but a varying degree from 0 to 1. Clearly, the approach proposed in Part II is a special case of the fuzzy approach, where the membership functions are either 0 ($imp_{i,j} = 0$) or 1 ($imp_{i,j} = 1$).

This methodology could be implemented, for example, in Equation (17), which could be rewritten as:

$$ISII_{j,n_k} = \frac{\sum_{i=1}^{30} \mu_{j,i,n_k}}{\sum_{i=1}^{30} \mu_{j,i}} 100 = \frac{MI_k}{MI} 100 \quad (17)$$

for which Equation (17) is a special case when the impact could only be fully present or absent. We think this analysis is helpful for two broad audiences. The first is the corporate community. For it, they can use it to determine which SASB issues are most congruent for them in terms of both doing well and doing good. In particular, since we have mapped the material ESG issues in each industry to the target level of the SDGs. This provides a company a well-structured narrative. It can simply point to its performance on its material ESG issues and the SDG targets for which these issues are relevant.

The second audience is investors. Again, assuming that ESG performance metrics are available, an investor can assess the implications at the target level to the relevant SDGs. The same can be done in a portfolio basis. At both a company and portfolio level, the above caveats apply. To this we would add adjustments based on company size (such as by revenues or market cap) and perhaps the location of their operations. While investors must put investment returns first, they are increasingly recognizing that the system-level impacts of their portfolios will affect their ability to generate these returns over the long term. Important work is being done here by The Investment Integration Project

(TIIP), a research service that helps investors to move their level of analysis beyond just portfolios to include the context in which these portfolios exist [30].

In order to serve both audiences, we are looking for ways to provide our detailed mapping in the public domain.

We would like to conclude with one final reflection. If good metrics existed for company performance on their material issues, one could use these ESG measures as proxies for SDG impact. They obviously wouldn't be impact measures. For the most part, the key performance indicators recommended by SASB are output measures which have outcomes that lead to impacts [9].

True measures of impact are difficult to obtain since they require data from outside the company. Impact measures are about positive and negative externalities being created by a company's operations. Most work to date on impact measurement has been done in the private markets. Developing methodologies for doing so in the public markets will be important for achieving the SDGs.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Target Specific Relevance Index (TSRI).

SASB General Issue Category	SDG Impacted	# of Targets Total	# of Targets Impacted	TSRI
Environment				
GHG emissions	7	3	2	66.70%
	9	5	1	20.00%
	12	8	1	12.50%
Air quality	3	9	4	44.40%
	11	7	1	14.30%
	12	8	2	25.00%
Energy management	3	9	4	44.40%
	7	3	3	100.00%
	9	5	2	40.00%
	12	8	3	37.50%
Fuel management	13	3	1	33.30%
	3	9	4	44.40%
	7	3	3	100.00%
	12	8	3	37.50%
Water and wastewater management	13	3	1	33.30%
	2	5	5	100.00%
	3	9	1	11.10%
	6	6	6	100.00%
	11	7	2	28.60%
	12	8	3	37.50%
Waste and hazardous materials management	14	7	4	57.10%
	15	9	3	33.30%
	3	9	1	11.10%
	6	6	4	66.70%
	8	10	2	20.00%
	11	7	2	28.60%
Waste and hazardous materials management	12	8	4	50.00%
	14	7	3	42.90%
	15	9	4	44.40%

Table A1. Cont.

SASB General Issue Category	SDG Impacted	# of Targets Total	# of Targets Impacted	TSRI
Biodiversity impacts	2	5	2	40.00%
	6	6	2	33.30%
	11	7	2	28.60%
	12	8	2	25.00%
	14	7	4	57.10%
15	9	5	55.60%	
Social Capital				
Human rights and community relations	1	5	2	40.00%
	6	6	6	100.00%
	8	10	5	50.00%
	10	7	3	42.90%
	11	7	2	28.60%
16	10	6	60.00%	
Access and affordability	1	5	2	40.00%
	3	9	2	22.20%
	5	6	2	33.30%
	7	3	1	33.30%
	8	10	1	10.00%
	9	5	3	60.00%
10	7	3	42.90%	
11	7	4	57.10%	
Customer welfare	2	5	3	60.00%
	3	9	3	33.30%
	4	7	2	28.60%
	6	6	3	50.00%
15	9	1	11.10%	
Data security and customer privacy	16	10	1	10.00%
Fair disclosure and labeling	2	5	2	40.00%
	3	9	4	44.40%
	4	7	1	14.30%
16	10	1	10.00%	
Fair marketing and advertising	1	5	2	40.00%
	2	5	1	20.00%
	3	9	4	44.40%
	4	7	3	42.90%
Human Capital				
Labor relations	1	5	2	40.00%
	3	9	4	44.40%
	8	10	7	70.00%
	10	7	3	42.90%
Fair labor practices	1	5	3	60.00%
	3	9	2	22.20%
	5	6	3	50.00%
	6	6	1	16.70%
	8	10	5	50.00%
	10	7	2	28.60%
16	10	2	20.00%	
Employee health safety and wellbeing	3	9	4	44.40%
	5	6	4	66.70%
	8	10	5	50.00%

Table A1. Cont.

SASB General Issue Category	SDG Impacted	# of Targets Total	# of Targets Impacted	TSRI
Diversity and inclusion	5	6	5	83.30%
	8	10	6	60.00%
	10	7	4	57.10%
	16	10	2	20.00%
Compensation and benefits	1	5	3	60.00%
	8	10	3	30.00%
	10	7	2	28.60%
Recruitment development and retention	4	7	2	28.60%
	5	6	2	33.30%
	8	10	5	50.00%
	9	5	2	40.00%
	10	7	3	42.90%
Business Model and Innovation				
Lifecycle impacts of products and services	3	9	4	44.40%
	6	6	2	33.30%
	7	3	3	100.00%
	8	10	1	10.00%
	9	5	2	40.00%
	11	7	3	42.90%
	12	8	3	37.50%
	13	3	1	33.30%
	14	7	2	28.60%
	15	9	5	55.60%
Environmental social impacts on assets & operations	16	10	1	10.00%
	1	5	1	20.00%
	2	5	2	40.00%
	3	9	1	11.10%
	6	6	3	50.00%
	7	3	1	33.30%
	9	5	2	40.00%
	11	7	3	42.90%
Product packaging	13	3	1	33.30%
	15	9	5	55.60%
	6	6	2	33.30%
	8	10	1	10.00%
	12	8	1	12.50%
	14	7	1	14.30%
Product quality and safety	15	9	4	44.40%
	2	5	3	60.00%
	3	9	1	11.10%
	12	8	1	12.50%
Leadership and Governance				
Systemic risk management	15	9	4	44.40%
	7	3	2	66.70%
	9	5	1	20.00%
	10	7	1	14.30%
	11	7	1	14.30%
16	10	2	20.00%	

Table A1. Cont.

SASB General Issue Category	SDG Impacted	# of Targets Total	# of Targets Impacted	TSRI
Accident and safety management	1	5	1	20.00%
	3	9	2	22.20%
	6	6	2	33.30%
	8	10	2	20.00%
	12	8	2	25.00%
	14	7	2	28.60%
Business ethics and transparency of payments	15	9	2	22.20%
	16	10	2	20.00%
Competitive behavior	1	5	3	60.00%
	7	3	2	66.70%
	9	5	2	40.00%
	10	7	2	28.60%
Regulatory capture and political influence	2	5	2	40.00%
	7	3	3	100.00%
	12	8	1	12.50%
	13	3	2	66.70%
	16	10	4	40.00%
Materials sourcing	3	9	3	33.30%
	5	6	1	16.70%
	6	6	1	16.70%
	8	10	2	20.00%
	12	8	3	37.50%
	13	3	1	33.30%
	15	9	5	55.60%
16	10	1	10.00%	
Supply chain management	1	5	4	80.00%
	3	9	3	33.30%
	5	6	2	33.30%
	6	6	2	33.30%
	7	3	3	100.00%
	8	10	3	30.00%
	9	5	3	60.00%
	10	7	2	28.60%
	11	7	1	14.30%
	12	8	3	37.50%
	13	3	1	33.30%
	14	7	4	57.10%
	15	9	4	44.40%
16	10	1	10.00%	

Table A2. Target ESG Relevance Index (TERI).

Target	# of SASB Issues Impacting the Target	TERI
Target 1.1	4	13.33%
Target 1.2	4	13.33%
Target 1.3	3	10.00%
Target 1.4	6	20.00%
Target 1.5	5	16.67%
Target 2.1	4	13.33%
Target 2.2	5	16.67%

Table A2. Cont.

Target	# of SASB Issues Impacting the Target	TERI
Target 2.3	2	6.67%
Target 2.4	6	20.00%
Target 2.5	3	10.00%
Target 3.1	8	26.67%
Target 3.2	8	26.67%
Target 3.3	1	3.33%
Target 3.4	10	33.33%
Target 3.5	4	13.33%
Target 3.6	1	3.33%
Target 3.7	2	6.67%
Target 3.8	3	10.00%
Target 3.9	14	46.67%
Target 4.1	0	0.00%
Target 4.2	0	0.00%
Target 4.3	2	6.67%
Target 4.4	3	10.00%
Target 4.5	2	6.67%
Target 4.6	0	0.00%
Target 4.7	1	3.33%
Target 5.1	5	16.67%
Target 5.2	3	10.00%
Target 5.3	2	6.67%
Target 5.4	2	6.67%
Target 5.5	5	16.67%
Target 5.6	1	3.33%
Target 6.1	4	13.33%
Target 6.2	5	16.67%
Target 6.3	9	30.00%
Target 6.4	9	30.00%
Target 6.5	2	6.67%
Target 6.6	4	13.33%
Target 7.1	8	26.67%
Target 7.2	7	23.33%
Target 7.3	8	26.67%
Target 8.1	5	16.67%
Target 8.2	3	10.00%
Target 8.3	4	13.33%
Target 8.4	7	23.33%
Target 8.5	8	26.67%
Target 8.6	1	3.33%
Target 8.7	4	13.33%
Target 8.8	8	26.67%
Target 8.9	8	26.67%
Target 8.10	0	0.00%
Target 9.1	4	13.33%
Target 9.2	5	16.67%
Target 9.3	1	3.33%
Target 9.4	6	20.00%
Target 9.5	2	6.67%
Target 10.1	5	16.67%
Target 10.2	7	23.33%
Target 10.3	4	13.33%
Target 10.4	3	10.00%
Target 10.5	3	10.00%
Target 10.6	0	0.00%
Target 10.7	0	0.00%
Target 11.1	3	10.00%

Table A2. Cont.

Target	# of SASB Issues Impacting the Target	TERI
Target 11.2	1	3.33%
Target 11.3	2	6.67%
Target 11.4	2	6.67%
Target 11.5	6	20.00%
Target 11.6	5	16.67%
Target 11.7	0	0.00%
Target 12.1	0	0.00%
Target 12.2	9	30.00%
Target 12.3	5	16.67%
Target 12.4	10	33.33%
Target 12.5	7	23.33%
Target 12.6	0	0.00%
Target 12.7	0	0.00%
Target 12.8	0	0.00%
Target 13.1	7	23.33%
Target 13.2	2	6.67%
Target 13.3	0	0.00%
Target 14.1	7	23.33%
Target 14.2	3	10.00%
Target 14.3	6	20.00%
Target 14.4	1	3.33%
Target 14.5	1	3.33%
Target 14.6	1	3.33%
Target 14.7	1	3.33%
Target 15.1	8	26.67%
Target 15.2	8	26.67%
Target 15.3	10	33.33%
Target 15.4	5	16.67%
Target 15.5	7	23.33%
Target 15.6	0	0.00%
Target 15.7	3	10.00%
Target 15.8	0	0.00%
Target 15.9	0	0.00%
Target 16.1	1	3.33%
Target 16.2	3	10.00%
Target 16.3	1	3.33%
Target 16.4	6	20.00%
Target 16.5	7	23.33%
Target 16.6	2	6.67%
Target 16.7	2	6.67%
Target 16.8	0	0.00%
Target 16.9	0	0.00%
Target 16.10	1	3.33%

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