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**Made to Measure:** Indicator  
Construction and Measurement  
Scales in ESG Score Design

**Edmund Bourne, Billie-Louise Schlich,  
and Charles Dodsworth**



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# Made to Measure: Indicator Construction and Measurement Scales in ESG Score Design

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## KEY FINDINGS

- n Standard setters and regulators rarely agree on the ESG information they ask companies to disclose across a majority of topics, or the exact format disclosures should take. This contributes toward an incomplete and heterogenous set of corporate disclosures.
- n ESG score providers build their own datasets from this corporate-disclosed ESG information. The indicators they choose to measure a topic can look very different in type, number, and structure—both against other ESG score providers and the information requested by standard setters.
- n Outside the ESG context, there is a developed literature on the process to define relevant information and indicators. Users would benefit from providers describing the principles and frameworks used to determine the set of indicators within their assessments.

## ABSTRACT

Building on a framework from Berg, Kölbel, and Rigobon (2022) and following on from our investigation of conceptions of materiality in ESG scores (see Dodsworth et al. 2023), this article explores another key stage in the creation of ESG scores—measurement strategies. The authors identify two key stages—indicator construction and measurement scale—and examine the available literature on measurement strategies for composite indicators in the context of ESG scores and those used in other fields (e.g., gender diversity, conservation). They also systematically analyze approaches to indicator construction and measurement scale as currently used by standard setters and leading ESG score providers and outline several recommendations to improve measurement across ESG models, including a framework to support more systematic indicator construction.

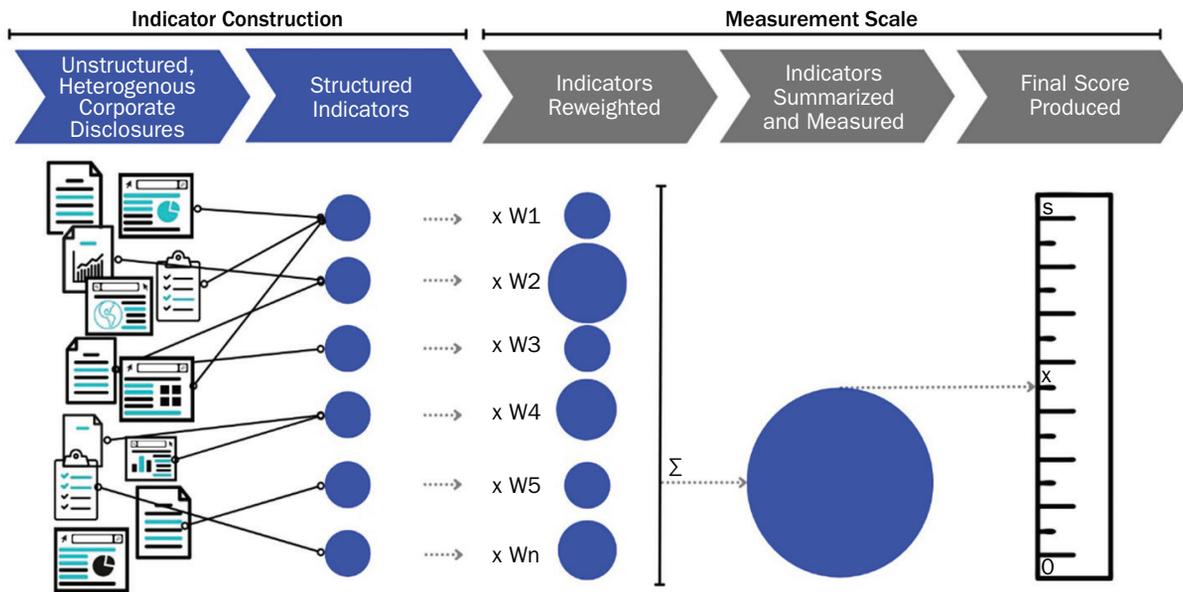
ESG ratings and scores are ubiquitous in sustainable investment despite ongoing criticism,<sup>1</sup> with a critical role in the investor toolbox to consolidate disparate information on diverse issues into a single score that encapsulates corporate sustainability.

<sup>1</sup>Nine out of 10 (88%) European fund managers profess to use ESG scores (Ninety One 2022). Meanwhile, nearly two in three (63%) respondents in a call for evidence on ESG scores and ratings for the European Securities and Markets Authority (ESMA 2022) indicate that they are dissatisfied with levels of transparency, alongside other notable concerns, including a lack of comparability and misalignment of definitions. In the United States, controversy around ESG investing is growing, with an increasing number of anti-ESG bills filed at the state level (Kerber 2023).

Whilst scrutiny of ESG scores is intensifying, there is a notable gap in the literature regarding their development and design. To elucidate the construction choices available to providers, this article builds on a framework developed by Berg, Kölbel, and Rigobon (2022), describing key stages in developing ESG scores. We focus on the second stage, measurement strategies,<sup>2</sup> complementing our earlier investigation of the first stage, scope (see Dodsworth et al. 2023). Having selected what topics to assess, providers of ESG scores must decide in the measurement stage how to measure company performance on these topics. Berg, Kölbel, and Rigobon (2022) identify this as the main source of variance in the overall score, estimating that it accounts for 56% of overall divergence in scores across six providers.

We identify two key steps in how ESG topics are measured—indicator construction and measurement scale (Exhibit 1)—and systematically analyze approaches to these stages by standard setters and leading ESG score providers. We focus our study on a single ESG topic—water—as a case study illustrating the challenges in indicator construction, surveying approaches by a sample of four leading standard setters and four major ESG data providers. Given the literature on design choices for ESG indicators is underdeveloped, we also examine the available literature for composite indicator design in other fields such as gender diversity or conservation. Finally, we produce a number of recommendations to improve measurement strategies and reduce unintentional measurement divergence across ESG models, including a set of principles that could be used to frame decision making in ESG indicator construction.

**EXHIBIT 1**  
Substages of Measurement in ESG Scores



<sup>2</sup>In the absence of well-established structures for ESG score development, our last article highlighted three phases of score design adopted from Berg, Kölbel, and Rigobon (2022) *Aggregate Confusion* as a useful framework for ESG score providers: scope—the sets of attributes being assessed; measurement—the method of measuring attributes and use of indicators; weight—the relative importance of attributes.

For the purposes of this article, we consider both ESG scores and ratings, denoting either analyst-led or algorithmically driven assessments that consider corporations' management of environmental, social, and governance issues and aggregate to a single metric or classification. The analysis focuses on assessments that primarily utilize data disclosed by corporations as part of annual reporting, whereas ESG score providers that primarily use outside-in information such as external news sources (e.g., Truvalue Labs, MarketPsych, or Reprisk) or assessments focused on specific sustainability topics (such as climate transition scores) are outside of the scope of the present assessment.

## INDICATOR CONSTRUCTION

ESG scores typically rely primarily on information harvested from a heterogeneous mix of corporate disclosures. These inputs can be complemented by other data sources (such as media sources, data on fines for ESG infractions, and information on the products and services provided by the company), but the bulk of data considered in ESG scores is taken from corporate sustainability disclosures (Boffo and Patalano 2020). This information set is shaped by three sets of key actors—standard setters and regulators, corporations, and ESG data providers (see Exhibit 2):

- **Standard setters and regulators** play a critical role by setting expectations for corporate reporting on ESG. These guidelines are still mostly voluntary, may cover only some ESG topics or industries, and are not always prescriptive<sup>3</sup> in terms of how or where specific information or metrics should be disclosed. There remains no universally accepted, overarching framework guiding sustainability disclosures, despite ongoing attempts to create a more coherent framework more akin to financial reporting.
- **Corporations** face a complex landscape of fast evolving ESG reporting expectations from regulators, standard setters, industry initiatives, investors, and data providers. This has created a rapidly growing corporate ESG reporting burden that creates challenges particularly for smaller corporations. In attempting to meet regulatory requirements and other stakeholder expectations, companies ultimately disclose an idiosyncratic and incomplete mix of ESG information in narrative form and as ESG-related data through a range of documents (e.g., annual and Corporate Social Responsibility (CSR) reports, webpages).<sup>4</sup>
- **ESG data providers** face the challenge of processing this heterogeneous information into a coherent set of indicators and systematic data collection efforts that ultimately provide the inputs for the creation of ESG scores.<sup>5</sup> In defining these ESG indicators<sup>6</sup> data providers take into account a number of

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<sup>3</sup>Existing reporting and regulatory standards typically allow companies to self-assess the materiality of ESG topics to their business, as well as providing open-ended disclosure requirements that leave room for a range of possible company responses for the same request.

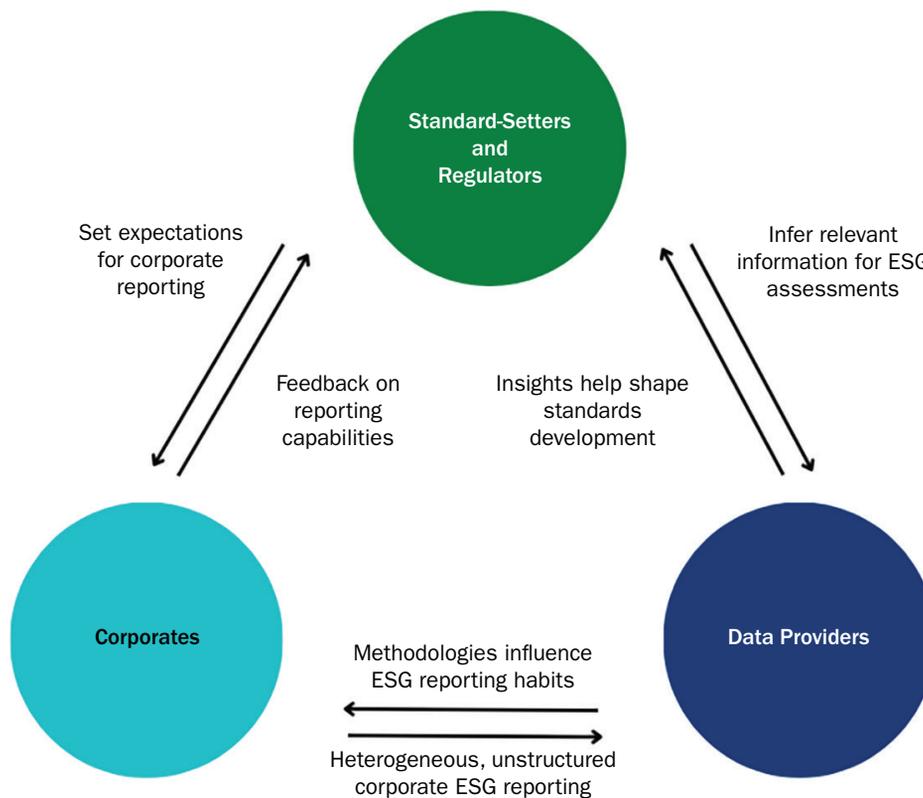
<sup>4</sup>We note the introduction of mandatory corporate reporting directives such as the EU's Corporate Sustainability Reporting Directive (CSRD) and the adoption of the IFRS's Sustainability Disclosure Standards may drive greater uniformity and completeness in company sustainability disclosures.

<sup>5</sup>Of the 13 ESG score providers in the SustainAbility Institute by Environmental Resources Management (ERM's) 2023 Rate the Raters report, 10 use passive sources of information—for example from company reports—for their primary ESG rating, as opposed to active sources such as questionnaires.

<sup>6</sup>We define ESG indicators as specific qualitative or quantitative pieces of information assessing observable and measurable characteristics that are generally comparable and also able to demonstrate change chronologically.

## EXHIBIT 2

## The ESG Measurement Ecosystem



different factors, including alignment with regulatory requirements and industry standards and the demands of their client base, particularly those of investors, and data availability in corporate disclosures. A handful of ESG metrics are widely accepted as relevant, for example Scope 1 and 2 emissions (Simmons et al. 2022), but in general there is seldom agreement on the exact form and structure of ESG indicators (Amel-Zadeh and Serafeim 2018) nor how they should be scored or according to which scale. As a result, each provider ultimately creates their own unique ESG dataset that forms the basis for their ESG score.

### Water: A Case Study

We focus our analysis on a single ESG topic—water—as a case study to illustrate the challenges in indicator construction, surveying approaches by a sample of four leading standard setters and four major ESG data providers.<sup>7</sup> Exhibit 3 categorizes information requested by standard setters and regulators on water management

<sup>7</sup>These include the Global Reporting Initiative (GRI); the Sustainability Accounting Standards Board (SASB) (both now part of the International Sustainability Standards Board [ISSB]); the World Economic Forum (WEF) framework developed as part of its Measuring Stakeholder Capitalism initiative; and the European Sustainability Reporting Standards (ESRS) developed by the European Financial Reporting Advisory Group (EFRAG). Among ESG score providers we focus on FTSE Russell, Refinitiv, MSCI, and S&P Global. We do not consider ESG scores that are created and maintained mainly for internal use and based on third-party data (e.g., those created by investors, banks, or intermediaries such as Amundi, LGIM, or Goldman Sachs).

### EXHIBIT 3 Categorizing ESG Information and Indicator Types

Information Type		Text from Water-Related Topics within Standards: Selected Examples	Water-Related Indicator from ESG Data Providers: Selected Examples
<b>Policies</b>	Information about a company's stated approach to an ESG topic. This could include an acknowledgment of the importance of the issue and/or commitment to tackle it.	<b>ESRS</b> Disclosure of whether and how policy addresses water management	<b>FTSE</b> Policy or commitment on water use reduction that: a. Addresses the issue b. Includes commitment to reduce water use or improve efficiency
<b>Governance and Oversight</b>	Information on how a company provides oversight of an ESG topic—at either board or management level. This can include the structures and committees that are established to provide appropriate controls around these issues.	<b>ESRS</b> Disclosure of how responsibility for respecting identified ecological threshold is allocated (water and marine resources)	<b>MSCI</b> Senior executive or executive committee is responsible for water management strategy and performance
<b>Risk Assessment and Management</b>	Information about how a company approaches the identification and management of risks associated with a given ESG issue. This can include formal risk identification processes, as well as those practices used to mitigate risks.	<b>SASB</b> Description of water management risks and discussion of strategies and practices to mitigate those risks	<b>S&amp;P</b> Water use assessment to identify opportunities for water efficiency improvements
<b>Monitoring</b>	Information on a company's progress on a topic. This may describe the process of identifying and reporting progress, relate to monitoring development of a company's stated goals, or detail third parties employed to validate progress.	<b>ESRS</b> Disclosure of quantitative and qualitative information regarding progress of actions or action plans disclosed in prior periods	<b>FTSE</b> Disclosure of results measured against previously set and disclose quantified targets: a. Applied at specific sites b. Applied throughout the company
<b>Reporting</b>	Information describing how a company ensures its reporting on an ESG issue is robust and comprehensive	<b>GRI</b> Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies, and assumptions used	<b>FTSE</b> Independent verification of water use data: a. Independent verification by third party b. International assurance standard used and level of assurance declared
<b>Impact</b>	Information concerning related impacts to society, for example.	<b>WEF</b> Valued societal impact of freshwater consumption and withdrawal	<b>Refinitiv</b> Does the company develop products or technologies that are used for water treatment or purification or that improve water use efficiency?
<b>Target and Target Details</b>	Information about companies' stated goals on an ESG issue—often including specifically stated quantitative aims. Could include a time frame, a change in performance on an issue (e.g., a relative or absolute reduction/increase), and proportion of business that is covered	<b>GRI</b> An explanation of the process for setting any water-related goals and targets that are part of the organization's approach to managing water and effluents and how they relate to public policy and the local context of each area with water stress	<b>Refinitiv</b> Has the company set targets or objectives to be achieved on water efficiency?  In scope, are the short-term or long-term reduction target to be achieved on efficiently using the water at business operations?

(continued)

**EXHIBIT 3** *(continued)***Categorizing ESG Information and Indicator Types**

Information Type		Text from Water-Related Topics within Standards: Selected Examples		Water-Related Indicator from ESG Data Providers: Selected Examples
<b>Quantitative</b>	Containing quantitative, numerical information about an ESG topic. This can include amounts of a natural resource consumed (e.g., water, materials) or emissions (GHG, NOX, SOX), as well as similar numbers on social or governance issues (e.g., women on the board, number of independent board members)	<b>SASB</b>	Number of incidents of noncompliance associated with water quantity and/or quality permits, standards, and regulations	<b>MSCI</b> Percentage of water use from alternative water sources: the amount of water that the company obtains from alternative sources. Alternative water sources include seawater, brackish water, gray water, and rainwater.

**NOTES:** Full indicator list and sources in Exhibit A1. Greenhouse gases (GHG), nitrogen oxides (NOx), sulfur oxides (SOx).

and highlights the breadth of information requested on a single ESG topic, covering policies and governance processes, approaches to risk management and assessment, monitoring and reporting processes, and more quantitative information on performance—both current and targeted.

Standard setters also request different numbers and types of information in their recommendations, with the ESRS requesting disclosures for 89 pieces of water-related information from companies compared to five for the WEF. SASB<sup>8</sup> and GRI fall somewhere in the middle—with 45 and 23 criteria respectively (see Exhibit 4).<sup>9</sup> Although SASB and WEF request a large proportion of quantitative disclosures, the ESRS and GRI include many other types of information.

Open-ended requests from standard setters for a description, explanation, or contextual information on a topic allows a variety of responses to satisfy the same disclosure requirement. Such information is particularly useful when making comparisons across a small sample of companies or for delving deeper into the specifics of one company's ESG management. Companies have considerable leeway on how they can disclose this kind of information, which reduces its utility for drawing comparisons across wide cross-sections.

Even for quantitative disclosures, where guidelines tend to be more prescriptive, standard setters' guidelines differ significantly. Exhibit 5 shows that standard setters' requirements for quantitative water information cover a range of attributes, with no clear consensus on which attributes should be included. We did not find water recycling metrics, for example, in GRI or WEF water management frameworks, while the ESRS and GRI appear to be the only standards requiring information on water storage.

Going further, even within the same information type (e.g., quantitative) and attribute (e.g., water withdrawal) disclosure requirements that are seemingly similar often involve subtle distinctions, limiting comparability of information. Disclosures require determinations by the standard setter on what water types or sources to consider (total, freshwater, by areas of high water stress, etc.) and the units to disclose in (megaliters, percentage).

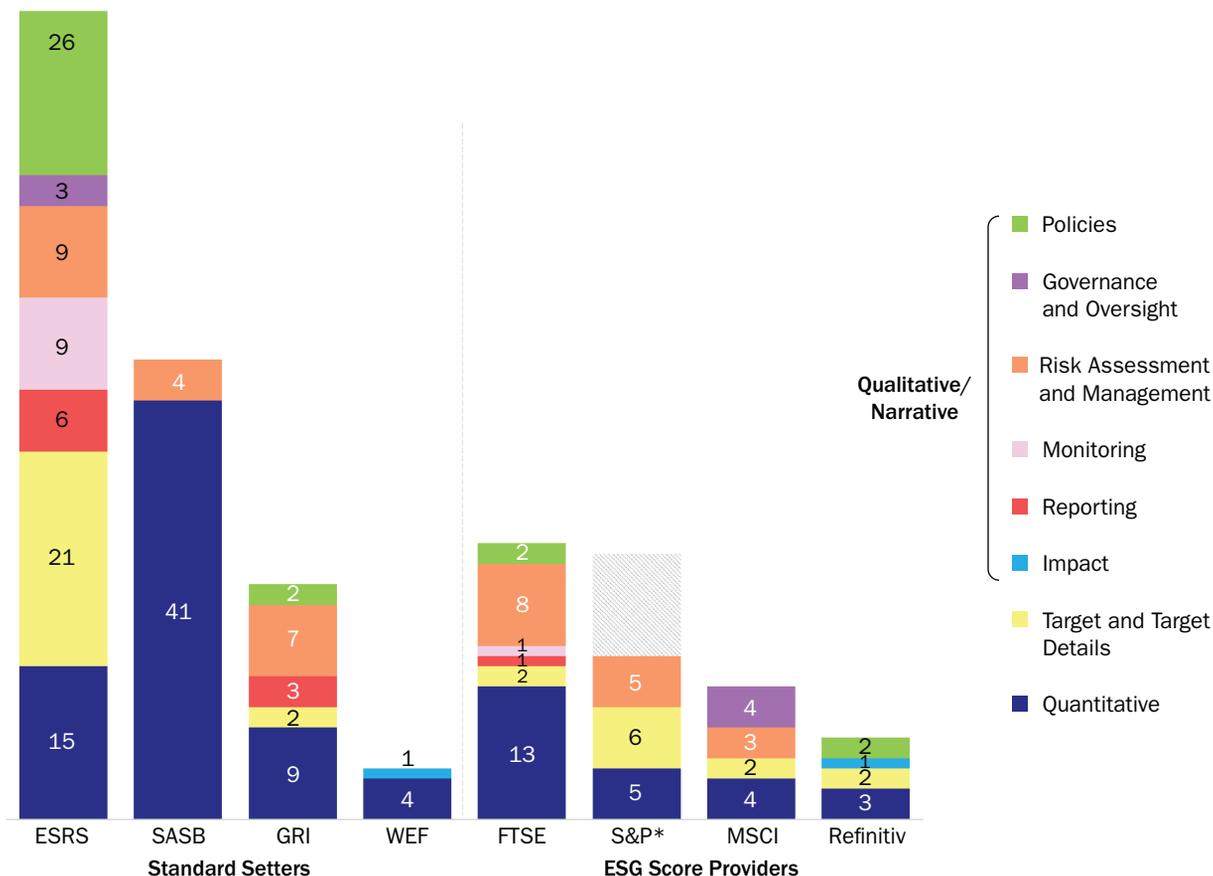
Although quantitative disclosure requirements are more common in environmental themes, this is not an issue confined solely to environmental topics. Reporting frameworks ask for a wide variety of quantitative information on health and safety (Exhibit 6), covering fatalities, lost time, and near misses. These terms use definitions

<sup>8</sup> SASB's use of sector-specific indicators leads to a high number of quantitative indicators.

<sup>9</sup> Exhibit A1 outlines our survey of water-related indicators within the reporting standards and ESG scores.

### EXHIBIT 4

#### Categorizing Water Management Information across Standards Setters and Regulators and Data Providers



NOTES: \*For S&P indicators, further breakdown for indicator analysis was not publicly available for 10 out of 12 water-related questions, so these were treated as individual indicators with categories unspecified. Full indicator list and sources in Exhibit A1.

### EXHIBIT 5

#### Categorizing Water Management Quantitative Information

Quantitative Information Requested	ESRS	SASB	GRI	WEF
Water withdrawal	Y	Y	Y	Y
Water consumption	Y	Y	Y	Y
Water intensity	Y	–	–	–
Water discharges	Y	–	Y	–
Water recycling	Y	Y	–	–
Water storage	Y	–	Y	–
Water emissions	–	Y	–	–
Noncompliance	–	Y	–	–
Other	Y	Y	–	–

NOTE: Full indicator list and sources in Exhibit A1.

that require subjective judgment (e.g., how to define lost time) and can look very different from one company or standard setter to another, creating information that is difficult to compare.

Companies use a range of guidelines from these standard setters to help produce their ESG disclosures. As we have outlined, they have considerable flexibility in their interpretation of requirements (particularly for qualitative descriptions) and the level of alignment with standards within their reporting, sometimes choosing to disclose a subset of information within one or more standards, where no mandatory requirements exists.

Then, ESG providers transform this idiosyncratic mix of corporate-reported ESG information into their own structured dataset. In the first instance, this involves defining specific, observable, and measurable characteristics, formalized in indicators,<sup>10</sup> on which

<sup>10</sup>In a second stage, unstructured information from company disclosures, alongside other sources, are reviewed against these indicators and an assessment of their performance produced.

## EXHIBIT 6

## Health and Safety Metrics from GRI, SASB, and OSHA

Metric	Description	Unit of Measure	Framework
Total Recordable Incident Rate	The number of incidents of work-related injury or illness per hours worked. This includes incidents resulting in death, days away from work, restricted work or transfer to another job, medical treatment beyond first aid, or loss of consciousness.	$\frac{\text{Recordable incidents} \times 200,000}{\text{Hours worked}}$	SASB; OSHA
Lost Time Incident Rate	Number of lost time incidents per million hours worked. A lost time incident is defined as absence from work beyond the date or shift when it occurred.	$\frac{\text{Lost time incidents} \times 1,000,000}{\text{Hours worked}}$	SASB
Fatality Rate	Number of fatalities per hour worked; broken down by direct employees and contractors.	$\frac{\text{Fatalities} \times 200,000}{\text{Hours worked}}$	SASB
Near Miss Frequency Rate	Number of near misses per hour worked, where a near miss is “an unplanned incident in which no property or environmental damage or personal injury occurred but where damage or personal injury easily could have occurred but for a slight circumstantial shift.”	$\frac{\text{Near misses} \times 200,000}{\text{Hours worked}}$	SASB
Fatality Rate from Work-Related Injuries	The number and rate of fatalities as a result of work-related injury.	$\frac{\text{Fatalities from work-Related injuries} \times (200,000 \text{ or } 1,000,000)}{\text{Hours worked}}$	GRI 403–9
High-Consequence Work-Related Injuries	The number and rate of high-consequence work-related injuries (excluding fatalities).	$\frac{\text{High consequence work-Related injuries (exc. fatalities)} \times (200,000 \text{ or } 1,000,000)}{\text{Hours worked}}$	GRI 403–9
Recordable Work-Related Injuries	The number and rate of recordable work-related injuries	$\frac{\text{Recordable work-Related injuries} \times (200,000 \text{ or } 1,000,000)}{\text{Hours worked}}$	GRI 403–9

**SOURCES:** GRI (2018a); US Bureau of Labor Statistics (n.d.); Sustainability Accounting Standards Board (n.d.).

to assess the company—often drawing upon insights from ESG reporting standards<sup>11</sup> but also influenced by existing corporate reporting practices and in-house expertise.<sup>12</sup> This requires ESG providers to each determine what good looks like for companies against their own slightly different criteria.

Exhibit 3 demonstrates how open-ended disclosure requirements are translated into more structured indicators in practice. For example, we see that requirements on governance and oversight from standard setters ask companies to disclose information on how responsibility for water management is arranged. Corresponding indicators from data providers look for concrete criteria—in this case whether there is a senior executive (or equivalent) that is responsible for water management. The largely descriptive nature of reporting often prompts providers to design indicators that generate Boolean responses (yes/no) to assess the content in a succinct data point (see Exhibit 7).

<sup>11</sup>Although in most areas the standard setters provide a baseline reference point, we also see areas where providers are forced to set their own requirements, particularly for new or emerging issues. See, for example, MSCI’s inclusion of consumer financial protection as a topic or S&P on financial inclusion, which stand distinct from topics selected by standard setters.

<sup>12</sup>We were unable to find detailed indicator construction principles for any provider in our sample. Bender et al. (2023) suggest ESG score providers use “intuition and reasonableness” to determine whether a metric is related or not.

## EXHIBIT 7

### Survey of Measurement Approaches within ESG Scores

ESG Score and Rating Providers	Indicators					Indicator Scoring				
	Overall Number	Qualitative (Y/N)	Quantitative (Y/N)	Controversies (Y/N)	Estimates (Y/N)	General vs. Sector-Specific Indicators <sup>a</sup>	Boolean (Y/N)	Scale (Y/N + Scale)	Performance (Y/N)	Relative or Absolute
FTSE Russell	>300	Y	Y	N	N	Y	Y	N	Y	Absolute
MSCI	1,000 data points 270 policies, programs, performance, and governance metrics	Y	Y	Y	Y	n/a	Y	Y: 0–10	Y	Mixture
Refinitiv	186 for scoring; typically between 70 and 170 per industry	Y	Y	Y (ESGC) N (ESG)	N	n/a	Y	Y: 0–100	Y	Relative
ISS	700 overall; 100 per company	Y~75%	Y~25%	Y	Y	40:60	Y	Y: 0–4	Y	Both
S&P Global	1,000 data points; 130 question level scores	Y	Y	Y	Y	40:60	Y(?)	Y: 0–100	Y	n/a
Morningstar Sustainalytics	70–90 per issuer	Y	Y	Y	n/a	n/a	n/a	Y: 0–100	Y	n/a

**NOTES:** <sup>a</sup>Whether providers describe how they make use of general indicators, that is, that apply to all companies versus specific indicators that might only be applied to a subset of companies based on a particular characteristic, for example, sector or country. ESG Controversies (ESGC).

**SOURCES:** Sustainalytics (2020a, 2020b); Refinitiv (2022); ISS (2023); MSCI (2024b, 2024c); FTSE Russell (2024); S&P (2024).

Constructing indicators in this way across ESG topics produces unique indicator sets for each ESG data provider. In Exhibit 4, we highlight significant differences in indicators that ESG data providers use to measure water—in number and type of indicators. Providers' water management topics comprise between 8 and 27 indicators, covering a wide range of indicator types in aggregate but showing little alignment in what is included within ESG scores from peer-to-peer.

Looking across the full set of ESG topics, we see significant differences in how data providers use indicators to measure issues within ESG models (see Exhibit 7). Once providers decide on a set of indicators from which to build their score (typically several hundred; 700+ in one case), they then isolate a list of relevant indicators for each company depending on sector and geographic exposure (among other things). Our analysis suggests that the number of indicators per ESG score is highly variable across providers—from more than 250 to fewer than 100. These indicators are also split in different proportions between qualitative and quantitative indicators, general and sector-specific indicators, and types of scoring techniques (Boolean, scaled or performance based).

## MEASUREMENT SCALE

Having constructed their indicators, ESG data providers then combine them into ESG subtopic or topic scores through a proprietary algorithm (a stage that we term measurement scale—see Exhibit 1). They make methodological judgments about the scoring and weighting of indicators, as well as the manner in which to aggregate

these assessments to subtopic or topic level. Providers also determine the scale for their ESG topic scores, as well as its nature (cardinal, ordinal, or categorical) and precision (granularity of divisions).

Only a small number of academic studies describe criteria for designing ESG indicators<sup>13</sup> and decisions around measurement scale are similarly understudied. Chen et al. (2021) and Joubrel and Maksimovich (2023) found providers typically employ a form of basic weighted average to aggregate up from indicator to an ESG topic or subtopic score. There is, however, almost no literature within the ESG score context that discusses choice of scale.

To better understand this stage of the ESG design process, we considered approaches within ESG scores produced by the same four major ESG data providers surveyed earlier. In a first step, we found that the indicators are brought together or aggregated into a single unit, using a variety of different numerical approaches. Weights are often derived from materiality levels<sup>14</sup> or are equally weighted<sup>15</sup> and then combined into a summary statistic.

A weakness of this approach is the introduction of compensatory elements. These occur where indicators are considered fungible against one another, allowing companies to substitute poor performance in one indicator or topic by good performance in another. Discussions as to whether alternative aggregation schemes for ESG scoring may be more suitable are relatively nascent (Gai et al. 2023), limited to more-developed topics like climate (for example, the TPI management quality<sup>16</sup> score that uses minimum thresholds via a staircase scoring) or governance (e.g., MSCI's deduction-based governance score MSCI 2024c).

In the second step, the aggregated indicator scores are translated into a single topic score against a consistent measurement scale. At this stage, practitioners can choose from a range of scales, for example, 0–5<sup>17</sup>, 0–100<sup>18</sup>, or AAA to CCC.<sup>19</sup> Although the choice of numerical or letter-based scale is relatively unimportant, the latter more clearly differentiates between an ordinal or cardinal scale, where for the numerical classification scales this differentiation is less clear.

A critical differentiating factor between the measurement scales are the degrees of differentiation that they offer, with some implying high levels of granularity to several decimal places. We were unable to identify in public documentation why each provider chose a particular scale or the relevant strength that a higher score showed relative to another, particularly for the more differentiated scores.

Finally, most providers offered scores relative to peers, with absolute scores being offered in some cases as a complement. The exact rules for defining peer groups (e.g., geographical or sectoral) are in most cases not clear.

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<sup>13</sup>Rahdari and Rostamy (2015) proposed eight criteria to determine included indicators.

<sup>14</sup>See, for example, page 5 of the S&P DJI ESG Score Methodology (S&P Dow Jones Indices 2023), where weights are industry specific and “based on S&P Global Sustainable1 Research’s reviews of the financial materiality of each topic to the specific industry.”

<sup>15</sup>See, for example, Refinitiv ESG Scores (Refinitiv 2022), where percentile indicator scores are summed to create category scores.

<sup>16</sup>The Transition Pathway Initiative uses a staircase system to measure corporation’s approach to climate management quality. Companies must meet several metrics on one step to advance to the next (Transition Pathway Initiative 2023).

<sup>17</sup>See, for example, FTSE Russell (2024).

<sup>18</sup>Refinitiv ESG Scores (Refinitiv 2022) or S&P DJI ESG Score Methodology (S&P Dow Jones Indices 2023).

<sup>19</sup>See, for example, the ESG ratings brochure from MSCI (2020).

## NON-ESG COMPOSITE INDICATORS

A range of disciplines have a more developed debate around the construction of indicators. Examining approaches from across a wide range of fields reveals that discrete decision-making processes such as multicriteria decision analysis offer potentially fruitful avenues to structure construction (and weighting) for indicators that is “particularly useful when dealing with conflicting objectives and trade-offs inherent in sustainability assessments” (Liu et al. 2023).

In specific contexts, various authors have also proposed conceptual frameworks to help construct indicators—for instance, Montenero, Kelble, and Broughton (2021) for ecosystems, Sandhu-Rojon (2018) for human development indexes, Marsden, Kelly, and Snell (2006) for performance management in transport, and Liberati et al. (2020) for conservation. We cataloged indicator construction principles and conceptual frameworks across several disciplines to reveal a number of similarities, documenting their underlying principles in Exhibit A2 to aid a cross-disciplinary comparison. Our analysis reveals considerable overlap in the criteria around indicator construction in the existing literature across disciplines (e.g., healthcare, biodiversity, conservation). This tends to center around a handful of critical characteristics, given in Exhibit 8.

Outside ESG, there exists a significant body of work regarding the combination of indicators. Handbooks on constructing composite indicators published by Nardo et al. (2005) for the OECD, and European Commission (n.d.) include entire chapters on aggregation techniques, and scores from other disciplines can employ alternative models such as geometric aggregation<sup>20</sup> or noncompensatory, multicriteria approaches like multidimensional synthesis of indicators (Biggeri and Ferrone 2021). A key theme from this was the undesirable consequence of compensatory models—like weighted averages—to allow for substitution between indicators or topics; an important consideration when combining indicators into topic scores.

Finally, research on measurement scale specifically is also considerably more developed in other disciplines. For example, ESG measurement displays many areas of similarity to utility theory and the measurement of preferences, where Roberts (1985) discusses how measurement accuracy can develop over time: “At an early stage of scientific development, measurement is usually performed at only the crudest level, that of classification.” Roberts then describes the shift from classifying to measuring as moving from declaring things as being “hot or cold” to “degrees of warmth”

### EXHIBIT 8

#### Criteria for Indicator Construction in Composite Indicators

<b>Alignment with Standards</b>	Ensuring alignment with existing best practices or market standards
<b>Data Availability</b>	Ensuring indicators have sufficient available data—both in terms of the existence of this data but avoiding exorbitant cost
<b>Parsimonious Model</b>	Ensuring indicators are complementary and do not seek to measure the same or heavily overlapping information
<b>Responsiveness</b>	Responsiveness to changes in the reality that the indicator seeks to measure
<b>Metric Quality</b>	Quality of indicator design, ensuring that metrics are specific, relevant, objective, understandable, and comparable

<sup>20</sup>For example, the United Nations Development Programme *Human Development Index* replaced the use of the arithmetic mean with the geometric mean in 2010 (UNDP 2010).

with a prerequisite for moving from a classification system to a numerical one being that there are “formal relations among quantities.” A further example of this is when creating indexes of environmental condition, Ebert and Welsch (2004) describe their creation as “a preference ordering of environmental states” and carefully examines the numerical relation between states.

Although ESG practitioners generally give little explanation as to how their measurement scale should be interpreted and valid uses, credit ratings are more transparent. For example, Fitch Ratings (n.d.) describes their credit ratings as those that “express risk in relative rank order, which is to say they are ordinal measures of credit risk and are not predictive of a specific frequency of default or loss.”

For a detailed review, the OECD’s (2008) handbook contains a specific section describing the intricacies of measurement scale construction in terms of choosing between nominal, ordinal, ratio, and interval scales. In light of this, practitioners should be careful to explain how their scores are constructed and how any resulting scale should be interpreted. There are few ESG topics that are developed enough to implement Roberts’ degrees of warmth. This may be possible for climate change where the quality of data, particularly quantitative metrics, is better, but in other topics that rely on more patchy and qualitative information (such as human rights) this remains hard to implement.

## CONCLUSION

In this study, we examined different approaches to measurement—the most important methodological step in ESG model development—accounting for 56% of divergence in a company’s final score or rating according to Berg, Kölbel, and Rigobon (2022). We segment measurement into two steps—indicator construction and measurement scale—and contrast approaches by regulators and standard setters, as well as major ESG score and ratings providers.

Although we have demonstrated in previous research that standard setters largely agree upon the ESG topic lists for companies (see Dodsworth et al. 2023), we show that they arrive at quite different disclosure recommendations for these. In practice, this leaves companies with broad discretion on how and to what extent to disclose information on their ESG performance. ESG providers in turn must define their own indicators to standardize this large, incomplete, and heterogeneous information set. These proprietary indicator sets align only loosely with those of divergent standards or other ESG data providers, with limited information on what has informed design choices.

This contrasts with fields outside ESG where similar composite indicators have been designed with more deliberate and transparent approaches. A review of the more developed literature on this indicator construction process within other disciplines shows consolidation around five principles that could be used to frame decision making in indicator construction (see Exhibit 8): alignment with standards, data availability, parsimony, responsiveness, and metric quality.

Our research suggests three useful avenues to reduce or articulate measurement divergence across ESG models:

1. Greater harmonization of ESG information across reporting standards. Although standard setters may agree on the list of relevant ESG topics and the principles for determining relevant ESG information, in practice they ask companies to disclose different types and amounts of information where harmonization would lower the reporting burden for companies and provide

greater usability of the resulting data for downstream consumers. There has already been some progress in this regard, with jurisdictions accounting for more than 40% of global market capitalization taking steps to endorse or implement the ISSB standards, but there remain significant markets that are yet to follow suit, including the United States.<sup>21</sup>

2. Greater transparency on the process to construct indicators by ESG score providers. ESG indicators are the first building block in the construction of an ESG score and the processes underlying their formulation are not currently publicly disclosed. Although ESG providers should maintain the flexibility to diverge methodologically, greater transparency around how indicators have been developed and constructed could reduce the opacity of ESG ratings and scores. This recommendation would go beyond current disclosure but only require the documentation and publication of existing practices rather than additional intellectual property development.
3. Providers should articulate how ESG topic scores are constructed and how any measurement scale should be interpreted. Limited explanation from providers on aggregation decisions or choice of measurement scale provides users significant latitude to misinterpret appropriate uses or transformations of scores. Though there may be commercial sensitivities around disclosing such information, we believe there is a scope for providers to go further in documenting existing practices; guidelines from International Organization of Securities Commissions (2021) have laid the groundwork for this with a specific recommendation on transparency<sup>22</sup> and are in the process of being referenced by regulators in a number of markets.<sup>23</sup>

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<sup>21</sup> See announcement from the International Financial Reporting Standards (IFRS 2024).

<sup>22</sup> See International Organization of Securities Commissions (ISOCO 2021), where Recommendation 5 states that “ESG ratings and data products providers could consider making adequate levels of public disclosure and transparency a priority for their ESG ratings...” and that “information regarding methodologies that ESG ratings and data products providers could consider publishing include the meaning of each assessment category (where applicable).”

<sup>23</sup> Examples include the United Kingdom’s Future Regulatory Regime for Environmental, Social, and Governance (ESG) Ratings Providers; European Union regulation of ESG Ratings Activities; Japan’s Code of Conduct for ESG Evaluation and Data Providers; Singapore’s Code of Conduct for ESG Ratings and Data Product Providers; and Hong Kong’s ESG Ratings Code of Conduct.

## APPENDIX

### EXHIBIT A1

#### Survey of Water-Related Information in ESG Standards and Indicators from ESG Score Providers

Standard Setter/ESG Score Provider	Information/Indicator	Type
ESRS	Total water consumption	Quantitative
ESRS	Total water consumption in areas at water risk, including areas of high-water stress	Quantitative
ESRS	Total water recycled and reused	Quantitative
ESRS	Total water stored	Quantitative
ESRS	Changes in water storage	Quantitative
ESRS	Water intensity ratio	Quantitative
ESRS	Water consumption—sectors/SEGMENTS [table]	Quantitative
ESRS	Additional water intensity ratio	Quantitative
ESRS	Total water withdrawals	Quantitative
ESRS	Total water discharges	Quantitative
ESRS	Disclosure of quantitative information about potential financial effects of material risks and opportunities arising from water and marine resources-related impacts	Quantitative
ESRS	Current financial resources allocated to action plan (Capex)	Quantitative
ESRS	Current financial resources allocated to action plan (Opex)	Quantitative
ESRS	Future financial resources allocated to action plan (Capex)	Quantitative
ESRS	Future financial resources allocated to action plan (Opex)	Quantitative
FTSE	Water withdrawals/consumption in water stressed regions	Quantitative
FTSE	Does the company disclose the number of incidents of noncompliance with water quality/quantity permits, standards, and regulations	Quantitative
FTSE	Three years of total water discharge data are disclosed by destination	Quantitative
FTSE	Three years of total water withdrawal data are disclosed by source	Quantitative
FTSE	Three years of facilities' water withdrawal data—for companies not disclosing company's overall data	Quantitative
FTSE	Three years of facilities' water discharge data—for companies not disclosing company's overall data	Quantitative
FTSE	Number or percentage of hydraulic fracturing sites/wells	Quantitative
FTSE	Three years of total water supply data are disclosed by the water utility	Quantitative
FTSE	Three years of power generation water withdrawal/consumption intensity (m <sup>3</sup> /kwh)	Quantitative
FTSE	Three years of mining production water consumption/withdrawal intensity (m <sup>3</sup> /tonne of ore)	Quantitative
FTSE	Three years of cement production water intensity (m <sup>3</sup> /tonne cement produced or cementitious materials)	Quantitative
FTSE	Three years of beverage production water intensity (m <sup>3</sup> /liter produced)	Quantitative
FTSE	Three years of food production water intensity (m <sup>3</sup> /tonne of food produced)	Quantitative
GRI	Total water withdrawal from all areas in megaliters and a breakdown of this total by the following sources, if applicable:	Quantitative
GRI	Total water withdrawal from all areas with water stress in megaliters, and a breakdown of this total by the following sources, if applicable:	Quantitative
GRI	A breakdown of total water withdrawal from each of the sources listed in Disclosures 303–3-a and 303–3-b in megaliters by the following categories:	Quantitative
GRI	Total water discharge to all areas in megaliters, and a breakdown of this total by the following types of destination, if applicable:	Quantitative
GRI	A breakdown of total water discharge to all areas in megaliters by the following categories:	Quantitative
GRI	Total water discharge to all areas with water stress in megaliters, and a breakdown of this total by the following categories:	Quantitative
GRI	Total water consumption from all areas in megaliters	Quantitative
GRI	Total water consumption from all areas with water stress in megaliters	Quantitative
GRI	Change in water storage in megaliters, if water storage has been identified as having a significant water-related impact	Quantitative

(continued)

**EXHIBIT A1** *(continued)***Survey of Water-Related Information in ESG Standards and Indicators from ESG Score Providers**

Standard Setter/ESG Score Provider	Information/Indicator	Type
MSCI	Percentage of water use from alternative water sources	Quantitative
MSCI	Water recycling rate	Quantitative
MSCI	Water intensity trend	Quantitative
MSCI	Water intensity vs. peers	Quantitative
Refinitiv	Water pollutant emissions to revenues USD in millions	Quantitative
Refinitiv	Water recycled	Quantitative
Refinitiv	Water use to revenues USD in millions	Quantitative
S&P	A. Withdrawal: total municipal water supplies (or from other water utilities)	Quantitative
S&P	B. Withdrawal: fresh surface water (lakes, rivers, etc.)	Quantitative
S&P	C. Withdrawal: fresh groundwater	Quantitative
S&P	D. Discharge: water returned to the source of extraction at similar or higher quality as raw water extracted (only applies to B and C)	Quantitative
S&P	E. Total net freshwater consumption (A+B+C–D)	Quantitative
SASB	Total water withdrawn	Quantitative
SASB	Total water consumed	Quantitative
SASB	Percentage of total water consumed in regions with high or extremely high baseline water stress	Quantitative
SASB	Percentage of total water withdrawn in regions with high or extremely high baseline water stress	Quantitative
SASB	Percentage in regions with high or extremely high baseline water stress of total fresh water withdrawn	Quantitative
SASB	Percentage of total fresh water withdrawn that is in regions with high or extremely high baseline water stress	Quantitative
SASB	Percentage of water withdrawn in regions with high or extremely high baseline water stress	Quantitative
SASB	Percentage of water consumed in regions with high or extremely high baseline water stress	Quantitative
SASB	Percentage of fresh water withdrawn in regions with high or extremely high baseline water stress	Quantitative
SASB	Percentage of fresh water consumed in regions with high or extremely high baseline water stress	Quantitative
SASB	Percentage of total fresh water withdrawn in regions with high or extremely high baseline water stress	Quantitative
SASB	Percentage recycled of total fresh water withdrawn	Quantitative
SASB	Percentage of total fresh water withdrawn that is recycled	Quantitative
SASB	Percentage of fresh water handled in operations that is recycled	Quantitative
SASB	Hydrocarbon content in discharged water	Quantitative
SASB	Percentage of produced water and flowback generated that is discharged	Quantitative
SASB	Total water withdrawn by portfolio area with data coverage, by property subsector	Quantitative
SASB	Percentage of total water withdrawn in regions with high or extremely high baseline water stress, by property subsector	Quantitative
SASB	Number of incidents of noncompliance associated with water quality permits	Quantitative
SASB	Number of incidents of noncompliance with water quality standards	Quantitative
SASB	Number of incidents of noncompliance with water quality regulations	Quantitative
SASB	Number of incidents of noncompliance associated with water quality standards	Quantitative
SASB	Number of incidents of noncompliance associated with water quality regulations	Quantitative
SASB	Number of incidents of noncompliance associated with water quality permits, standards, and regulations	Quantitative
SASB	Number of incidents of noncompliance associated with water quantity and/or quantity permits, standards, and regulations	Quantitative
SASB	Number of incidents of noncompliance with water quality permits, standards, and regulations	Quantitative
SASB	Number of incidents of noncompliance associated with water quantity and/or quality permits	Quantitative
SASB	Number of incidents of noncompliance associated with water quantity and/or quality standards	Quantitative
SASB	Number of incidents of noncompliance associated with water quantity and/or quality regulations	Quantitative
SASB	Number of incidents of noncompliance associated with water quantity and/or quality permits, standards, and regulations	Quantitative
SASB	Total fresh water withdrawn	Quantitative
SASB	Total fresh water consumed	Quantitative

*(continued)*

**EXHIBIT A1** *(continued)***Survey of Water-Related Information in ESG Standards and Indicators from ESG Score Providers**

<b>Standard Setter/ESG Score Provider</b>	<b>Information/Indicator</b>	<b>Type</b>
SASB	Total volume of fresh water handled in operations	Quantitative
SASB	Volume of produced water and flowback generated	Quantitative
SASB	Percentage of produced water and flowback generated that is injected	Quantitative
SASB	Percentage of produced water and flowback generated that is recycled	Quantitative
SASB	Percentage of hydraulically fractured wells for which there is public disclosure of all fracturing fluid chemicals used	Quantitative
SASB	Percentage of hydraulic fracturing sites where ground or surface water quality deteriorated compared to a baseline	Quantitative
SASB	Like-for-like percentage change in water withdrawn for portfolio area with data coverage, by property subsector	Quantitative
SASB	Water withdrawal data coverage as a percentage of total floor area, by property subsector	Quantitative
SASB	Water withdrawal data coverage as a percentage of floor area in regions with high or extremely high baseline water stress, by property subsector	Quantitative
WEF	Total water withdrawn	Quantitative
WEF	Percentage of water withdrawn from water stressed areas	Quantitative
WEF	Total water consumed	Quantitative
WEF	Percentage of water consumed from water stressed areas	Quantitative
ESRS	Disclosure of whether and how policy addresses water management	Policies
ESRS	Disclosure of whether and how policy addresses the use and sourcing of water and marine resources in own operations	Policies
ESRS	Disclosure of whether and how policy addresses water treatment	Policies
ESRS	Disclosure of whether and how policy addresses prevention and abatement of water pollution	Policies
ESRS	Disclosure of whether and how policy addresses product and service design in view of addressing water-related issues and preservation of marine resources	Policies
ESRS	Disclosure of whether and how policy addresses commitment to reduce material water consumption in areas at water risk	Policies
ESRS	Disclosure of time frame in which policies in areas of high-water stress will be adopted	Policies
ESRS	Policies or practices related to sustainable oceans and seas have been adopted	Policies
ESRS	The policy contributes to good ecological and chemical quality of surface water bodies and good chemical quality and quantity of groundwater bodies, in order to protect human health, water supply, natural ecosystems and biodiversity, the good environmental status of marine waters, and the protection of the resource base upon which marine-related activities depend	Policies
ESRS	The policy minimize material impacts and risks and implement mitigation measures that aim to maintain the value and functionality of priority services and to increase resource efficiency on own operations	Policies
ESRS	The policy avoids impacts on affected communities	Policies
ESRS	Information about specific collective action for water and marine resources	Policies
ESRS	Disclosure of reasons for not having adopted policies in areas of high-water stress	Policies
ESRS	Description of key contents of policy	Policies
ESRS	Description of scope of policy or of its exclusions	Policies
ESRS	Description of consideration given to interests of key stakeholders in setting policy	Policies
ESRS	Explanation of whether and how policy is made available to potentially affected stakeholders and stakeholders who need to help implement it	Policies
ESRS	Disclosure of key action	Policies
ESRS	Description of scope of key action	Policies
ESRS	Time horizon under which key action is to be completed	Policies
ESRS	Description of key action taken, and its results, to provide for and cooperate in or support provision of remedy for those harmed by actual material impacts	Policies
ESRS	Disclosure of the type of current and future financial and other resources allocated to the action plan	Policies

*(continued)*

**EXHIBIT A1** *(continued)***Survey of Water-Related Information in ESG Standards and Indicators from ESG Score Providers**

<b>Standard Setter/ESG Score Provider</b>	<b>Information/Indicator</b>	<b>Type</b>
ESRS	Disclosure of reasons for not having adopted policies	Policies
ESRS	Disclosure of time frame in which the undertakings aim to adopt policies	Policies
ESRS	Disclosure of reasons for not having adopted actions	Policies
ESRS	Disclosure of time frame in which the undertakings aim to adopt actions	Policies
FTSE	Policy or commitment on water use reduction	Policies
FTSE	Policy or commitment by the water utility on leakage	Policies
GRI	Describe its policies or commitments regarding the material topic	Policies
GRI	A description of any minimum standards set for the quality of effluent discharge and how these minimum standards were determined, including	Policies
Refinitiv	Policy emissions	Policies
Refinitiv	Policy water efficiency	Policies
ESRS	Relationship with policy objectives	Target and Target Details
ESRS	Measurable target	Target and Target Details
ESRS	Baseline value	Target and Target Details
ESRS	Baseline year	Target and Target Details
ESRS	Disclosure of whether and how target relates to management of material impacts, risks, and opportunities related to areas at water risk	Target and Target Details
ESRS	Disclosure of whether and how target relates to responsible management of marine resources impacts, risks, and opportunities	Target and Target Details
ESRS	Disclosure of whether and how target relates to reduction of water consumption	Target and Target Details
ESRS	(Local) ecological threshold and entity-specific allocation were taken into consideration when setting water and marine resources target	Target and Target Details
ESRS	Target relates to reduction of water withdrawals	Target and Target Details
ESRS	Target relates to reduction of water discharges	Target and Target Details
ESRS	Adopted and presented water and marine resources-related target is mandatory (based on legislation)	Target and Target Details
ESRS	Nature of target	Target and Target Details
ESRS	Description of scope of target	Target and Target Details
ESRS	Period to which target applies	Target and Target Details
ESRS	Indication of milestones or interim targets	Target and Target Details
ESRS	Description of methodologies and significant assumptions used to define target	Target and Target Details
ESRS	Target related to environmental matters is based on conclusive scientific evidence	Target and Target Details
ESRS	Disclosure of whether and how stakeholders have been involved in target setting	Target and Target Details
ESRS	Description of any changes in target and corresponding metrics or underlying measurement methodologies, significant assumptions, limitations, sources, and adopted processes to collect data	Target and Target Details
ESRS	Disclosure of time frame for setting of measurable outcome-oriented targets	Target and Target Details

*(continued)*

**EXHIBIT A1** *(continued)***Survey of Water-Related Information in ESG Standards and Indicators from ESG Score Providers**

<b>Standard Setter/ESG Score Provider</b>	<b>Information/Indicator</b>	<b>Type</b>
ESRS	Description of reasons why there are no plans to set measurable outcome-oriented targets	Target and Target Details
FTSE	Time-specific target(s) to reduce water consumption/withdrawal at the company level	Target and Target Details
FTSE	Time-specific target(s) to reduce water consumption/withdrawal at the specific sites impacted by water stress	Target and Target Details
GRI	An explanation of the process for setting any water-related goals and targets that are part of the organization's approach to managing water and effluents and how they relate to public policy and the local context of each area with water stress	Target and Target Details
GRI	Report the following information about tracking the effectiveness of the actions taken: i. processes used to track the effectiveness of the actions; ii. goals, targets, and indicators used to evaluate progress; iii. the effectiveness of the actions, including progress toward the goals and targets, lessons learned, and how these have been incorporated into the organization's operational policies and procedures	Target and Target Details
MSCI	Track record of achieving water use reduction targets	Target and Target Details
MSCI	Aggressiveness of water use reduction targets	Target and Target Details
Refinitiv	Targets emissions	Target and Target Details
Refinitiv	Targets water efficiency	Target and Target Details
S&P	Target for A. Withdrawal: Total municipal water supplies (or from other water utilities)	Target and Target Details
S&P	Target for B. Withdrawal: Fresh surface water (lakes, rivers, etc.)	Target and Target Details
S&P	Target for C. Withdrawal: Fresh groundwater	Target and Target Details
S&P	Target for D. Discharge: Water returned to the source of extraction at similar or higher quality as raw water extracted (only applies to B and C)	Target and Target Details
S&P	Target for E. Total net freshwater consumption (A+B+C-D)	Target and Target Details
S&P	Establishment of targets to reduce water use	Target and Target Details
ESRS	Disclosure of qualitative information of potential financial effects of material risks and opportunities arising from water and marine resources-related impacts	Risk Assessment and Management
ESRS	Description of effects considered and related impacts (water and marine resources)	Risk Assessment and Management
ESRS	Description of related products and services at risk (water and marine resources)	Risk Assessment and Management
ESRS	Disclosure of whether and how assets and activities have been screened in order to identify actual and potential water and marine resources-related impacts, risks, and opportunities in own operations and upstream and downstream value chain and methodologies, assumptions, and tools used in screening	Risk Assessment and Management
ESRS	Disclosure of how consultations have been conducted (water and marine resources) [text block]	Risk Assessment and Management
ESRS	Layer in mitigation hierarchy to which action and resources can be allocated to (water and marine resources)	Risk Assessment and Management
ESRS	Disclosure of actions and resources in relation to areas at water risk	Risk Assessment and Management
ESRS	Disclosure of ecological threshold identified and methodology used to identify ecological threshold (water and marine resources)	Risk Assessment and Management

*(continued)*

**EXHIBIT A1** *(continued)***Survey of Water-Related Information in ESG Standards and Indicators from ESG Score Providers**

<b>Standard Setter/ESG Score Provider</b>	<b>Information/Indicator</b>	<b>Type</b>
ESRS	Disclosure of how ecological entity-specific threshold was determined (water and marine resources)	Risk Assessment and Management
FTSE	Water management plan (including water recycling system)	Risk Assessment and Management
FTSE	Water-stressed/scarce regions	Risk Assessment and Management
FTSE	Detailed disclosure of action(s) taken to reduce water withdrawal/consumption	Risk Assessment and Management
FTSE	Does the company engage with its stakeholders at water stressed sites	Risk Assessment and Management
FTSE	Works with all stakeholders to reduce water withdrawal/consumption	Risk Assessment and Management
FTSE	Financial quantification of: a. Costs associated with water-related risks b. Investment in R&D to mitigate water-related risks	Risk Assessment and Management
FTSE	Detailed disclosure by the water utility of action(s) taken to reduce water leakage:	Risk Assessment and Management
FTSE	Reclaimed water used for potable drinking water	Risk Assessment and Management
GRI	Priority substances of concern for which discharges are treated, including: how priority substances of concern were defined and any international standard	Risk Assessment and Management
GRI	A description of the approach used to identify water-related impacts, including the scope of assessments, their time frame, and any tools or methodologies used	Risk Assessment and Management
GRI	A description of how water-related impacts are addressed, including how the organization works with stakeholders to steward water as a shared resource and how it engages with suppliers or customers with significant water-related impacts	Risk Assessment and Management
GRI	Describe the actual and potential, negative and positive impacts on the economy, environment, and people, including impacts on their human rights	Risk Assessment and Management
GRI	Report whether the organization is involved with the negative impacts through its activities or as a result of its business relationships and describe the activities or business relationships	Risk Assessment and Management
GRI	Describe actions taken to manage the topic and related impacts	Risk Assessment and Management
GRI	Describe how engagement with stakeholders has informed the actions taken (3–3-d) and how it has informed whether the actions have been effective (3–3-e)	Risk Assessment and Management
MSCI	Implementation of water-efficient production processes	Risk Assessment and Management
MSCI	Water reduction strategy	Risk Assessment and Management
MSCI	Evidence of using alternative water sources	Risk Assessment and Management
S&P	Water use assessment to identify opportunities for water efficiency improvements	Risk Assessment and Management
S&P	Actions to reduce water consumption	Risk Assessment and Management
S&P	Actions to improve wastewater quality	Risk Assessment and Management
S&P	Application of water recycling	Risk Assessment and Management
S&P	Awareness training provided to employees on water efficiency management programs	Risk Assessment and Management

*(continued)*

**EXHIBIT A1** *(continued)***Survey of Water-Related Information in ESG Standards and Indicators from ESG Score Providers**

<b>Standard Setter/ESG Score Provider</b>	<b>Information/Indicator</b>	<b>Type</b>
SASB	Description of water management risks and discussion of strategies and practices to mitigate those risks	Risk Assessment and Management
SASB	Discussion of strategy or plans to address water consumption and disposal-related risks, opportunities, and impacts	Risk Assessment and Management
SASB	Description of water management risks and discussion of management strategies and practices to mitigate those risks	Risk Assessment and Management
SASB	Discussion of water management risks and description of strategies and practices to mitigate those risks	Risk Assessment and Management
ESRS	Disclosure of contextual information regarding water consumption	Reporting
ESRS	Disclosure of critical assumptions used in estimates of financial effects of material risks and opportunities arising from water and marine resources-related impacts	Reporting
ESRS	Explanation of how time horizons are defined, financial amounts are estimated, and critical assumptions made (water and marine resources)	Reporting
ESRS	Share of the measure obtained from direct measurement, from sampling and extrapolation or from best estimates	Reporting
ESRS	Disclosure of the type of current and future financial and other resources allocated to the action plan (Capex and Opex)	Reporting
ESRS	Explanation of how current financial resources relate to most relevant amounts presented in financial statements	Reporting
FTSE	Independent verification of water use data	Reporting
GRI	Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies, and assumptions used	Reporting
GRI	Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies, and assumptions used, including whether the information is calculated, estimated, modeled or sourced from direct measurements and the approach taken for this, such as the use of any sector-specific factors	Reporting
GRI	A description of how the organization interacts with water, including how and where water is withdrawn, consumed, and discharged and the water-related impacts the organization has caused or contributed to or that are directly linked to its operations, products, or services by its business relationships (e.g., impacts caused by runoff)	General
ESRS	Disclosure of quantitative and qualitative information regarding progress of actions or action plans disclosed in prior periods	Monitoring
ESRS	Description of metric used to evaluate performance and effectiveness, in relation to material impact, risk, or opportunity	Monitoring
ESRS	Disclosure of methodologies and significant assumptions behind metric	Monitoring
ESRS	Type of external body other than assurance provider that provides validation	Monitoring
ESRS	Description of performance against disclosed target	Monitoring
ESRS	Effectiveness of policies and actions is tracked in relation to material sustainability-related impact, risk, and opportunity	Monitoring
ESRS	Description of processes through which effectiveness of policies and actions is tracked in relation to material sustainability-related impact, risk, and opportunity	Monitoring
ESRS	Description of defined level of ambition to be achieved and of any qualitative or quantitative indicators used to evaluate progress	Monitoring
ESRS	Base year from which progress is measured	Monitoring
FTSE	Disclosure of results measured against previously set and disclosed quantified targets	Monitoring
ESRS	Disclosure of how responsibility for respecting identified ecological threshold is allocated (water and marine resources)	Governance and Oversight
ESRS	Description of most senior level in organization that is accountable for implementation of policy	Governance and Oversight
ESRS	Disclosure of third-party standards or initiatives that are respected through implementation of policy	Governance and Oversight

*(continued)*

**EXHIBIT A1** *(continued)*

**Survey of Water-Related Information in ESG Standards and Indicators from ESG Score Providers**

Standard Setter/ESG Score Provider	Information/Indicator	Type
MSCI	CEO is responsible for water management strategy and performance	Governance and Oversight
MSCI	CSR or sustainability committee is responsible for water management strategy and performance	Governance and Oversight
MSCI	Nonexecutive- or noncommittee-level task force is responsible for water management strategy and performance	Governance and Oversight
MSCI	Senior executive or executive committee is responsible for water management strategy and performance	Governance and Oversight
Refinitiv	Water technologies	Impact
WEF	Valued societal impact of freshwater consumption and withdrawal	Impact
S&P	Water consumption in water-stressed areas	Unspecified
S&P	Ultrapure water usage	Unspecified
S&P	Water-saving devices	Unspecified
S&P	Water efficiency programs for real estate portfolio	Unspecified
S&P	Leakage rate	Unspecified
S&P	Business impacts of water-related incidents	Unspecified
S&P	Exposure to water-stressed areas	Unspecified
S&P	Water risk management programs	Unspecified
S&P	Exposure of suppliers to water risks	Unspecified
S&P	Water risks management of suppliers	Unspecified

**NOTE:** Specific information text or indicator text shortened in some instances for brevity.

**SOURCES:** SASB (n.d.); WEF (n.d.) (note: indicators from “Fresh Water Availability”); FTSE Russell (2018); GRI (2018b, 2021); Refinitiv (2019) (note: filtered for mentions of water); EFRAG (2024) (note: indicators from ESRS E3 and ESRS 2 MDR); MSCI (2024a); S&P Global (2024) (note: further breakdown for indicator analysis not publicly available for 10 out of 12 water-related questions, so these 10 were treated as individual rows and categorized as unspecified).

**EXHIBIT A2**

**Survey of Indicator Construction Principles from Guidelines and Composite Indicators across Disciplines**

Principle	Author	Topic	Alignment with Standards	Data Availability	Parsimonious Model	Responsiveness	Metric Quality			
							Specific	Relevant	Objective	Understandable
Realism	Liberati et al.	Conservation	Y	Y						
Standardized vs. Customizable	Liu et al.	N/A	Y							Y
Theoretically well founded	OECD	Environmental	Y							
International consensus about validity	OECD	Environmental	Y							
Theoretical basis	Rice and Rochet	Fisheries	Y							
Provide basis for international comparisons	OECD	Environmental	P	P						Y
Relevance for assessing equality and human rights	Clark	Equality	P							

*(continued)*

## EXHIBIT A2 (continued)

## Survey of Indicator Construction Principles from Guidelines and Composite Indicators across Disciplines

Principle	Author	Topic	Alignment with Standards	Data Availability	Parsimonious Model	Responsiveness	Metric Quality			
							Specific	Relevant	Objective	Understandable
Public participation, legitimacy and ownership	Clark	Equality	P							
Public awareness	Rice and Rochet	Fisheries	P							
Eligible	Rahdari and Rostamy	ESG		Y	Y			P		Y
Data-availability	Liberati et al.	Conservation		Y		Y	Y			
Accuracy, reliability, and validity	Clark	Equality		Y				Y	Y	
Availability of historical data	Rice and Rochet	Fisheries		Y						
Long-term data availability	Montenero, Kelble, and Broughton	Ecosystem		Y						
Readily available at a reasonable cost/benefit ratio	OECD	Environmental		Y						
Comparability across space and over time	Clark	Equality		Y						
Selected indicators should not impose too large a burden on government agencies or the general public	Clark	Equality		Y						
Easily available	Humbert and Guenther	Gender Diversity		Y						
Availability	European Commission's DG Enterprise and Industry	Innovation		Y						
Cost	Rice and Rochet	Fisheries		Y						
Show trends over time	OECD	Environmental		P		Y				Y
National in scope	OECD	Environmental		P						
Easy to understand	Marsden, Kelly, and Snell	Transport			Y		Y			Y
Minimal (relevant)	Rahdari and Rostamy	ESG			Y		Y			
Relevance in terms of coverage versus salience	Clark	Equality			Y					
Autonomous	Rahdari and Rostamy	ESG			Y					
Communal	Rahdari and Rostamy	ESG			Y					
Redundancy	European Commission's DG Enterprise and Industry	Innovation			Y					

(continued)

**EXHIBIT A2** *(continued)***Survey of Indicator Construction Principles from Guidelines and Composite Indicators across Disciplines**

Principle	Author	Topic	Alignment with Standards	Data Availability	Parsimonious Model	Responsiveness	Metric Quality			
							Specific	Relevant	Objective	Understandable
First comer privilege	European Commission's DG Enterprise and Industry	Innovation			Y					
Correlation	European Commission's DG Enterprise and Industry	Innovation			Y					
Cumulative	Rahdari and Rostamy	ESG			P					
Exhaustive	Rahdari and Rostamy	ESG			P					
Representative picture	OECD	Environmental			P					
Responsive	Liberati et al.	Conservation				Y				
Responsiveness to changes	Montenero, Kelble, and Broughton	Ecosystem				Y				
Responsiveness to management actions	Montenero, Kelble, and Broughton	Ecosystem				Y				
Responsive to changes	OECD	Environmental				Y				
Whenever possible and appropriate indicators should be dynamic rather than static	Clark	Equality				Y				
Relevance for public policy	Clark	Equality				Y				
Responsiveness	Rice and Rochet	Fisheries				Y				
Responsive	Marsden, Kelly, and Snell	Transport				Y				
Updated at regular intervals	OECD	Environmental				P				
Trackable	Sandhu-Rojon	Human Development				P				
Policy relevance	European Commission's DG Enterprise and Industry	Innovation				P				
Sensitivity	Rice and Rochet	Fisheries				P				
Clearly defined	Marsden, Kelly, and Snell	Transport					Y		Y	
Specificity	Sandhu-Rojon	Human Development					Y			
Noncorruptible	Marsden, Kelly, and Snell	Transport					Y			

*(continued)*

## EXHIBIT A2 (continued)

## Survey of Indicator Construction Principles from Guidelines and Composite Indicators across Disciplines

Principle	Author	Topic	Alignment with Standards	Data Availability	Parsimonious Model	Responsiveness	Metric Quality			
							Specific	Relevant	Objective	Understandable
Operational/measurable	Rahdari and Rostamy	ESG					P			
Measurable	Sandhu-Rojon	Human Development					P			
Measurability	Montenero, Kelble, and Broughton	Ecosystem					P			
Measurable	Marsden, Kelly, and Snell	Transport					P			
Ideally indicators should relate to individuals	Clark	Equality					P			
Relevant	Liberati et al.	Conservation						Y		
Importance to the ecosystem and culture	Montenero, Kelble, and Broughton	Ecosystem						Y		
Relevance to report questions	Montenero, Kelble, and Broughton	Ecosystem						Y		
Relevant	Sandhu-Rojon	Human Development						Y		
Emphasize results in terms of outcomes, processes, or autonomy	Clark	Equality						P		
Harmonized and comparable across research teams	Humbert and Guenther	Gender Diversity							Y	Y
Objective and unidirectional	Humbert and Guenther	Gender Diversity							Y	
Concreteness	Rice et al.	Fisheries							Y	
Reliable and valid	Humbert and Guenther	Gender Diversity							P	
Confidence	Liberati et al.	Conservation							P	
Adequately documented and of known quality	OECD	Environmental							P	
Easy to interpret	OECD	Environmental								Y
Clearly defined and operationalized	Humbert and Guenther	Gender Diversity								Y
Threshold or reference value to compare against	OECD	Environmental								Y

(continued)

**EXHIBIT A2** *(continued)***Survey of Indicator Construction Principles from Guidelines and Composite Indicators across Disciplines**

Principle	Author	Topic	Alignment with Standards	Data Availability	Parsimonious Model	Responsiveness	Metric Quality			
							Specific	Relevant	Objective	Understandable
Resonant	Liberati et al.	Conservation								
Lends itself to being linked to economic models, forecasting, and information systems	OECD	Environmental								
Disaggregation of statistics by population subgroups	Clark	Equality								
Monotonic	Rahdari and Rostamy	ESG								
Attainable	Sandhu-Rojon	Human Development								
Measurement	Rice and Rochet	Fisheries								
Specificity	Rice and Rochet	Fisheries								
Controllable	Marsden, Kelly, and Snell	Transport								

**NOTE:** Y denotes match; P denotes partial match.

**SOURCES:** OECD (1993); Rice and Rochet (2005); Marsden, Kelly, and Snell (2006); Clark (2008); European Commission's DG Enterprise and Industry (2009); Rahdari and Rostamy (2015); Humbert and Guenther (2017); Sandhu-Rojon (2018); Liberati et al. (2020); Montenero, Kelble, and Broughton (2021); Liu et al. (2023).

## REFERENCES

- Amel-Zadeh, A., and G. Serafim. 2018. "Why and How Investors Use ESG Information: Evidence from a Global Survey." *Financial Analysts Journal* 74 (3): 87–103.
- Bender, J., C. He, S. Maffina, and X. Sun. 2023. "Peeling Back the Onion: Understanding What Goes into an ESG Rating." *The Journal of Impact and ESG Investing* 4 (1): 11–32.
- Berg, F., J. F. Kölbel, and R. Rigobon. 2022. "Aggregate Confusion: The Divergence of ESG Ratings." *The Review of Finance* 26 (6): 1315–1344.
- Biggeri, M., and L. Ferrone. 2021. "Measuring Child Multidimensional Deprivation: A Sustainability Perspective." *Sustainability* 13 (7): 3922.
- Boffo, R., and R. Patalano. 2020. "ESG Investing: Practices, Progress and Challenges." OECD Paris. [www.oecd.org/finance/ESG-Investing-Practices-Progress-and-Challenges.pdf](http://www.oecd.org/finance/ESG-Investing-Practices-Progress-and-Challenges.pdf).
- Chen, L., L. Zhang, J. Huang, H. Xiao, and Z. Zhou. 2021. "Social Responsibility Portfolio Optimization Incorporating ESG Criteria." *Journal of Management Science and Engineering* 6 (1): 75–85.
- Clark, D. A. 2008. "Relevant Criteria for Selecting Indicators a Proposal." Background paper, Centre for the Analysis of Social Exclusion, London School of Economics and Political Science. [lse.ac.uk](http://lse.ac.uk).
- Dodsworth, C., E. Bourne, B.-L. Schlich, and J. Kooroshy. 2023. "Financial, Double, or Dynamic? Theories of ESG Materiality and Practitioner Approaches." *The Journal of Impact and ESG Investing* 4 (2): 109–131.

Ebert, U., and H. Welsch. 2004. "Meaningful Environmental Indices: A Social Choice Approach." *Journal of Environmental Economics and Management* 47 (2): 270–283.

EFRAG (European Financial Reporting Advisory Group). 2024. "IG 3—List of ESRS Datapoints." European Financial Reporting Advisory Group.

ESMA (European Securities and Markets Authority). 2022. "Ref: Outcome of ESMA Call for Evidence on Market Characteristics of ESG Rating and Data Providers in the EU." [https://www.esma.europa.eu/sites/default/files/library/esma80-416-347\\_letter\\_on\\_esg\\_ratings\\_call\\_for\\_evidence\\_june\\_2022.pdf](https://www.esma.europa.eu/sites/default/files/library/esma80-416-347_letter_on_esg_ratings_call_for_evidence_june_2022.pdf).

European Commission. n.d. "Step 7: Aggregating Indicators." Competence Centre on Composite Indicators and Scoreboards. [europa.eu](http://europa.eu).

European Commission's DG Enterprise and Industry. 2009. "Handbook on Constructing Composite Indicators." European Commission's DG Enterprise and Industry. [eustat.eus](http://eustat.eus).

Fitch Ratings. n.d. "About Ratings Definitions." Fitch Ratings. [fitchratings.com](http://fitchratings.com).

FTSE Russell. 2018. "Methodology Enhancements 2018–2019 Research Cycle." FTSE Russell. [jse.co.za](http://jse.co.za).

—. 2024. "Guide to FTSE and Third Party ESG Data Used in FTSE Indices v1.4." FTSE Russell. [lseg.com](http://lseg.com).

Gai, L., M. Bellucci, M. Biggeri, L. Ferrone, and F. Ielasi. 2023. "Banks' ESG Disclosure: A New Scoring Model." *Finance Research Letters* 57: 104199.

GRI (Global Reporting Initiative). 2018a. "GRI 403: Occupational Health and Safety 2018." In *GRI—Topic Standard for Occupational Health and Safety*. Global Reporting Initiative. [globalreporting.org](http://globalreporting.org).

—. 2018b. "GRI 303: Water and Effluents 2018." In *GRI—GRI Standards English Language*. Global Reporting Initiative. [globalreporting.org](http://globalreporting.org).

—. 2021. "GRI 3: Material Topics 2021." In *GRI—GRI Standards English Language*. Global Reporting Initiative. [globalreporting.org](http://globalreporting.org).

Humbert, A., and A. Guenther. 2017. "D3.1 The Gender Diversity Index, Preliminary Considerations and Results." GEDII. <https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5b16abef3&appld=PPGMS#:~:text=Each%20of%20the%20metric%20considered,men%20in%20any%20given%20indicator>.

IFRS (International Financial Reporting Standards). 2024. "Jurisdictions Representing over Half the Global Economy by GDP Take Steps towards ISSB Standards." International Financial Reporting Standards. <https://www.ifrs.org/news-and-events/news/2024/05/jurisdictions-representing-over-half-the-global-economy-by-gdp-take-steps-towards-issb-standards/#:~:text=Many%20jurisdictions%20are%20seeking%20full,to%20the%20greatest%20extent%20possible>.

IOSCO (International Organization of Securities Commissions). 2021. "Environmental, Social and Governance (ESG) Ratings and Data Products Providers. Final Report." [iosco.org](http://iosco.org).

ISS. 2023. "ESG Corporate Rating: Methodology and Research Process." International Organization of Securities Commissions. [issgovernance.com](http://issgovernance.com).

Joubrel, M., and E. Maksimovich. 2023. "ESG Data and Scores." In *Valuation and Sustainability*, pp. 67–98. New York, NY: Springer.

Kerber, R. 2023. "Focus: Business Fights Back as Republican State Lawmakers Push Anti-ESG Agenda." Reuters.

- Liberati, M. R., S. P. Sowa, C. A. May, and P. J. Doran. 2020. "Making Measures Count: Structured Indicator Selection to Improve Program Success." *Environmental and Sustainability Indicators* 8: 100077. <https://www.sciencedirect.com/science/article/pii/S2665972720300611>.
- Liu, Y., J. Osterrieder, B. H. Misheva, N. Koenigstein, and L. Baals. 2023. "Navigating the Environmental, Social, and Governance (ESG) Landscape: Constructing a Robust and Reliable Scoring Engine—Insights into Data Source Selection, Indicator Determination, Weighting and Aggregation Techniques, and Validation Processes for Comprehensive ESG Scoring Systems." [europa.eu](https://www.europa.eu).
- Marsden, G., C. Kelly, and C. Snell. 2006. "Selecting Indicators for Strategic Performance Management." *Transportation Research Record* 1956: 21–29.
- Montenero, K., C. Kelble, and K. Broughton. 2021. "A Quantitative and Qualitative Decision-Making Process for Selecting Indicators to Track Ecosystem Condition." *Marine Policy* 129: 104489. <https://www.sciencedirect.com/science/article/pii/S0308597X21001007>.
- MSCI. 2020. "MSCI ESG Ratings." MSCI.
- . 2024a. "MSCI ESG Ratings Methodology: Water Stress Key Issue." MSCI. <https://www.msci.com/documents/1296102/34424357/MSCI+ESG+Ratings+Methodology+-+Water+Stress+Key+Issue.pdf/24ce1c1d-d2de-5bcb-a51b-a1945c7ecd0?t=1666182603843>.
- . 2024b. "ESG Ratings Process." MSCI. <https://www.msci.com/documents/1296102/34424357/MSCI+ESG+Ratings+Methodology+-+Process.pdf/820e4152-4804-fe33-0a67-8ee4c6a8fd7d?t=1666300410683>.
- . 2024c. "ESG Ratings Methodology." MSCI. <https://www.msci.com/documents/1296102/34424357/MSCI+ESG+Ratings+Methodology.pdf>.
- Nardo, M. et al. 2005. "Handbook on Constructing Composite Indicators: Methodology and User Guide." Statistics Working paper no. 2005/03, OECD Publishing. [https://www.oecd-ilibrary.org/economics/handbook-on-constructing-composite-indicators\\_533411815016](https://www.oecd-ilibrary.org/economics/handbook-on-constructing-composite-indicators_533411815016).
- Ninety One. 2022. "Ninety One Survey Finds European Fund Industry Overly Reliant on ESG Scores." Ninety One.
- OECD. 1993. "OECD Core Set of Indicators for Environmental Performance Reviews. A Synthesis Report by the Group on the State of the Environment." OECD. [ecd.org](https://www.oecd.org).
- . 2008. *Handbook on Constructing Composite Indicators: Methodology and User Guide*. OECD. [europa.eu](https://www.europa.eu).
- Rahdari, A. H., and A. A. A. Rostamy. 2015. "Designing a General Set of Sustainability Indicators at the Corporate Level." *Journal of Cleaner Production* 108: 757–771.
- Refinitiv. 2019. "Refinitiv ESG Glossary." Refinitiv. [https://bigiavi.sba.unibo.it/cataloghi-e-risorse-online/eikon-datastream/refinitiv\\_esg\\_glossary-5.xlsx](https://bigiavi.sba.unibo.it/cataloghi-e-risorse-online/eikon-datastream/refinitiv_esg_glossary-5.xlsx).
- . 2022. "Environmental, Social and Governance Scores from Refinitiv." Refinitiv. [https://www.refinitiv.com/content/dam/marketing/en\\_us/documents/methodology/refinitiv-esg-scores-methodology.pdf](https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf).
- Rice, J., and M.-J. Rochet. 2005. "A Framework for Selecting a Suite of Indicators for Fisheries Management." *ICES Journal of Marine Science* 62 (3): 516–527.
- Roberts, F. 1985. "Measurement Theory with Applications to Decisionmaking, Utility, and the Social Sciences." In *Encyclopedia of Mathematics and Its Applications*, vol. 7. Cambridge University Press, UK. <https://www.cambridge.org/core/books/measurement-theory/7D75B72C3E5FA676EA7AD6AB4D8DF4A7>.
- Sandhu-Rojon, R. 2018. "Selecting Indicators for Impact Evaluation." Research to Action.

S&P. 2024. "S&P Global ESG Scores Methodology." S&P.

S&P Dow Jones Indices. 2023. "S&P DJI ESG Score Methodology." S&P Dow Jones Indices. [spglobal.com](https://spglobal.com).

S&P Global. 2024. "CSA Handbook 2024." S&P Global. [https://portal.s1.spglobal.com/survey/documents/CSA\\_Handbook.pdf](https://portal.s1.spglobal.com/survey/documents/CSA_Handbook.pdf).

Simmons, J., J. Kooroshy, E. Bourne, M. Jain, and L. Clements. 2022. "Mind the Gaps: Clarifying Corporate Carbon." FTSE Russell. [lseg.com](https://www.ftserussell.com).

Sustainability Accounting Standards Board. n.d. "Download SASB Standards." Sustainability Accounting Standards Board. [ifrs.org](https://www.sasb.org).

SustainAbility Institute by ERM. 2023. "Rate the Raters 2023." SustainAbility Institute by ERM. <https://www.sustainability.com/globalassets/sustainability.com/thinking/pdfs/2023/rate-the-raters-report-april-2023.pdf>.

Sustainalytics. 2020a. "Overview of Sustainalytics' ESG Risk Ratings." Sustainalytics.

———. 2020b. "The ESG Risk Rating: Frequently Asked Questions—For Companies." Sustainalytics.

UNDP (United Nations Development Programme). 2010. "Human Development Report 2010: The Real Wealth of Nations: Pathways to Human Development." United Nations Development Programme. [undp.org](https://www.undp.org).

U.S. Bureau of Labor Statistics. n.d. "BLS OSH Definitions." U.S. Bureau of Labor Statistics.

WEF (World Economic Forum). n.d. "Stakeholder Capitalism: Explore the Metrics." World Economic Forum. [weforum.org](https://www.weforum.org).