Chapter 6
Disclosing and Reporting Environmental Sustainability of Supply Chains

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6.1 Why Do Firms Disclose?

Environmental disclosure and reporting can be broadly defined as the various methods that businesses use to communicate their environmental impacts, responsibilities, and mitigation activities to stakeholders. Although practitioners often use the words "disclosure" and "reporting" interchangeably, they can be distinguished in terms of "what" is communicated versus "how" it is communicated. *Disclosure* involves previously unknown, secret, or proprietary information. In contrast, *reporting* is the communication process—often structured—by which the disclosed information is transmitted to the public, shareholders, stakeholders, or governments. The decision of what and when to disclose is specific to each setting; companies make disclosure decisions while considering internal objectives, external pressure, and regulatory requirements. And the decision of how to report these disclosures is similarly a function of internal and external forces.

Non-financial reporting largely started in Europe in 1970s Germany with social reporting and the Organisation for Economic Co-operation and Development's (OECD) Social Indicators reporting program. Regulatory disclosure gained momentum in the United States during the 1980s with the "right to know" legislation set forth in the Superfund Amendments and Reauthorization Act. This legislation established the Toxic Release Inventory, wherein companies were asked to disclose the production and release of toxic chemicals (EPA 2015). Then, in 1989, voluntary reporting further came into focus in the United States following the massive oil spill by Exxon Valdez. The Valdez Principles were introduced by the Coalition for Environmentally Responsible Economies (CERES), which outlined the first major environmental conduct and reporting practices specifically for companies (Sanyal and Neves 1991).

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At the international level, the United Nations Rio Earth Summit in 1992 and the Rio+20 Summit in 2012 have encouraged companies to act and be accountable through reporting on social and environmental responsibility (UNEP 2014).

The driving forces for environmental sustainability reporting and corporate disclosure of other types of information are not different. However, unlike other information disclosed by companies, stakeholder pressure and brand positioning have been the dominant forces for environmental sustainability disclosure. Environmental reporting is a relatively recent practice that is often complex and hard to verify, requiring data from multiple supply chain partners. Often, it is difficult for an organization to navigate the increasing number of reporting and disclosure alternatives available.

Private firms are used to disclosing information on their activities. Companies disclose for four primary reasons: (1) to satisfy requirements imposed by governments and regulators; (2) to satisfy requirements from shareholders; (3) to communicate attributes of the brand, products or services to current and future customers and consumers; and (4) to mitigate reputational risks with other stakeholders such as NGOs, the communities in which they operate, their own employees, and the public at large.

In general, environmental disclosure and reporting rates are high in the developed world. According to the consulting firm KPMG, companies reported at rates of 86 % in the United States and 91 % in the United Kingdom in 2013 (KPMG 2013). Even more promising is the rapid growth of companies reporting in the developing areas of the world, such as Asia Pacific. For example, rates of companies reporting in China increased from 59 % in 2011 to 75 % in 2013. While the growing global rates of environmental reporting are encouraging, they largely represent reporting limited to the company level without addressing the impacts of the supply chain.

6.1.1 Regulatory Disclosures

Although many companies are choosing to report voluntarily or due to pressure from external stakeholders, there are governmental policies that force companies to report on specific environmental practices or impacts. If a company is found to be in noncompliance, it can, in some cases, be penalized. Most existing policies require disclosure only on the company's own internal practices, not on the practices of external partners along the supply chain. However, the requirement to disclose internal practices forces companies to reevaluate processes that may be substandard, and may force them to look into those same practices in their supply chains. Furthermore, regulation can vary across cities, states, and countries; this variability holds multinational companies to a multiplicity of regulatory mandates. Some examples of this include the European Union's Registration, Evaluation, Authorization, and Restriction of Chemicals Act (REACH), France's Grenelle II Act, the United States' Dodd-Frank Act, and California's AB 32 Global Warming Solutions Act.

As an example of basic disclosure policies, the REACH Act requires companies to report their use of specific chemicals and the measures in place to handle them

safely. The requirements of this act are based on the quantity of the chemical used and the risk associated with the chemical (Europa 2014). Companies are required to report this information; the information is then included in a public repository managed by the European Union (EU). This repository includes information about quantity, use, and emergency management plans for chemicals used in European operations and products. In addition, if products contain one or more of the 161 chemicals that are classified as substances of very high concern (SVHC) at a quantity above a 0.1 % weight-by-weight threshold, this information must be communicated to the consumer. For example, because it sells its computers in Europe, Dell complied with this requirement by reporting on its website that none of its products contained any SVHC above the required threshold (DELL 2010). In addition to the reporting of chemicals used in operations and products, the REACH Act also includes in its Annex XVII a list of outlawed chemicals that include chemicals like mercury and chloroform (European Chemical Agency 2014).

Some governments have taken mandatory environmental disclosures a step further. Similar to the objective of reporting platforms like the Global Reporting Initiative (GRI) and the CDP (formerly the Carbon Disclosure Project), the French government made company-wide environmental reporting mandatory. Under President Nicolas Sarkozy, the French government created the Grenelle de l'environnement, a French roundtable on sustainable development, in 2007. Through this roundtable, a series of national environmental commitments was created. Released in 2012, Article 225 of the Grenelle II Act requires companies to report on their environmental practices (IRSE 2012). It mandates that French companies with 500 or more employees must produce an annual report that includes third-party vetted environmental, social, and governance indicators. Although many parts of the Grenelle regulation have yet to be enacted, the reporting component of the regulatory mandates was implemented and companies are complying.

The French government also proposed regulation to achieve higher levels of corporate transparency. Based on pilot projects in 2011, legislation was planned for a multi-criteria product label that would include information on carbon footprint, water use, and biodiversity impacts across the entire supply chain (Department of the Commissioner-General for Sustainable Development 2012). Given the rigorous, costly, and time-consuming nature of this data collection, this part of the legislation had not been put into place at the time of this writing (2015).

In the United States, the Dodd-Frank Act became one of the first regulatory mandates to (indirectly) require companies to deeply examine their supply chains. The act is actually a financial disclosure policy, but Section 1502 of the Act requires companies to report whether any of their products contain conflict minerals (GPO 2012). Conflict minerals include tantalum, tin, tungsten, and gold sourced from conflict regions in the Democratic Republic of Congo. These minerals are used to make anything from smartphones to jewelry. The main suppliers of these minerals are commonly four or five tiers deep in a brand owner's supply chain. Therefore, although the requirement sounds straightforward, it requires companies to conduct investigations into often highly complex and impermeable supply chains of smelters, primary metals processors, component makers, and interconnecting import/export firms. Moreover, even when a primary supplier of a mineral has been identified, the

reporting company still may not know whether the mineral was sourced from a conflict region or not, due to the highly secretive and opaque nature of the industry (Businessweek 2014). Chapter 5 by Blass et al. (2017) discusses material flows and regulations surrounding such non-renewable materials in more detail.

Although the mandate only requires that companies establish whether or not they use any conflict minerals in their products, most companies also want to avoid the use of conflict minerals in their products. Phasing out sources of conflict minerals includes working with industry groups like the Electronics Industry Citizenship Council (EICC) to audit smelters (the linchpin in the conflict mineral supply chain) to provide transparency onto the source of minerals and allow companies to purchase conflict-free minerals (Businessweek 2014).

At the state level, the state of California enacted the California Global Warming Solutions Act, AB 32 (CARB 2014a, b), in 2006. This policy requires that all industrial facilities, fuel suppliers, and electricity importers report greenhouse gas emissions (GHG emissions) annually through the California Reporting System. The policy came into force in 2008 and remains a requirement. California then took the reporting requirement a step further, by requiring emissions reductions across the same sources through a cap-and-trade program.

California's cap-and-trade program requires that businesses and organizations comply with a reduction of GHGs to 1990 levels by the year 2020 (CARB 2014b). The requirement, which began in 2013 for electric utilities and industrial facilities, requires about a 3 % reduction annually through carbon pricing. The mandate to reduce annual levels will potentially lead to investment in clean technologies. In 2015, the policy will expand to distributors of transportation, natural gas and other fuels (CARB 2011). Policy frameworks such as AB 32 guide companies from mere disclosure toward substantive emissions reductions. This type of regulatory framework can be successful because it links reporting with management, as the reporting process itself reveals areas that need improvement. While findings on success are limited at this time, the system has been broadly adopted across the state.

6.1.2 Additional Pressure to Report

While regulations require companies to report on impacts of their operations, there are additional pressures that encourage companies to report voluntarily.

These include two main mechanisms: (a) multi-stakeholder public agreements and (b) shareholder engagement.

6.1.2.1 Multi-Stakeholder Public Agreements

Multi-stakeholder public agreements refer to environmental commitments by a firm through engagement of public, private, and nongovernmental actors' concerns. By bringing together a diverse group of key stakeholders, company leaders

can argue a market interest, or at least mitigate any risks of being left behind, when explaining environmental commitments to shareholders and employees. By committing to a path of improvement, companies are implicitly committing to measure, disclose, and ultimately make progress—voluntarily—on well-defined environmental issues.

For instance, on January 31, 1999, Secretary-General Kofi Annan announced the United Nations Global Compact. The Compact is an initiative to encourage businesses and other organizations worldwide to both adopt sustainable and socially responsible policies and to report on their practices. The Compact is based on ten principles within the four major categories of human rights, labor, environment, and anti-corruption (UN Global Compact 2015). Under the environmental principles, the Global Compact suggests companies should report on their precautionary approach to environmental challenges, on initiatives to promote greater environmental responsibility, and on the diffusion of environmentally friendly technologies. Under each of these principles, companies should describe their assessment, policies and goals; implementation; and measurement of outcomes in their reports. By reporting on its four main categories and their ten sub-principles, an organization will be able to communicate progress to its stakeholders as well as maintain an Active Status under the Global Compact.

With 12,000 companies and organizations from over 145 countries as participants, the Compact represents the largest voluntary initiative established thus far. As a part of its framework, the Compact includes a policy called the Communication on Progress (COP). The COP requires participants to increase their transparency and disclose their progress towards achieving the framework principles. If a company does not report its progress, it will no longer be considered a participant in the Compact. This and similar global initiatives have led to increasing rates of corporate reporting globally.

6.1.2.2 Shareholder Pressure

A more direct way to establish pressure for companies to report environmental impacts and drive reductions is to engage shareholders. Managers in public and private companies have a fiduciary responsibility toward shareholders, both for the short- and long-term financial viability of the business. Whenever environmental concerns can be connected with the long-term viability of the business, and shareholders are also aligned with this view, managers will be required to start measuring and reporting their environmental impacts.

However, it remains highly unclear whether corporate environmental reporting has significant impact on consumer choice or investor practices. Examining a limited set of companies listed in the FTSE 250 of the London Stock Exchange, Haddock-Fraser and Fraser (2008) found that consumer-facing companies were more likely to report than those that operating in a business-to-business setting. Given their analysis of listed companies, the authors conclude that "higher-turnover, public-listed companies" include consumers in their decision to report environmental practices (Haddock-Fraser and Fraser 2008: 153).

In most cases, the shareholder perception of corporate social responsibility (CSR) and embedded activities, including reporting, is neutral as long as these principles and activities increase shareholder value. However, some studies find that a company's decision to report and pursue environmentally focused activities may be negatively interpreted by shareholders due to the perception that any dollar spent toward environmentally and socially responsible activities may be seen as decreasing shareholder profit (Barnea and Rubin 2010). In Chap. 14, Jacobs et al. (2017) also find mixed evidence for how the stock market responds to environmental initiatives.

In both the consumer and shareholder pressure driven cases, only limited research, and a company's perception of the issue, informs the decision of whether or not to report. This means that a company's decision is often based on anecdotal evidence and perceived pressures from different sources.

The Dow Jones Sustainability Indices

The Dow Jones Sustainability Indices (DJSI) is a group of sustainability performance indices that evaluate environmental performance of companies listed on the Dow Jones Global Total Stock Market Index (DJSI). Launched in 1999, the DJSI evaluates corporate environmental and social attributes in conjunction with economic performance (DJSI 2015). Focusing on shareholder interests, the DJSI is the first set of global indices to track sustainability in companies. Although financial performance is a big part of the index, issues assessed include, but are not limited to, supply chain standards, risk management, and climate change mitigation. The DJSI uses both general and industry-specific criteria for evaluation. In addition to the main index, DJSI also has several geographically focused indices including Asia Pacific, Emerging Markets, Europe, North America, Australia, Korea, and Nordic. In addition, it manages industry indices, also known as "blue chip indices."

In 2012, the Dow Jones merged with the S&P Indices to become the S&P Dow Jones Indices. Together with Robeco SAM, an investment specialist for sustainability, they created "objective benchmarks for managing sustainability investment portfolios" (DJSI 2014). The DJSI selects over 3000 publicly traded companies to report on their sustainability practices; 800 of these companies are located in emerging markets (DJSI 2013). The corporate sustainability assessment identifies leaders across 59 industry groups, based on methodology that includes both general and industry-specific sustainability trends. Selecting companies for the DJSI index involves rating companies on a Total Sustainability Score based on Robeco SAM's Corporate Sustainability Index. The annual process begins in March, and scores are released in September of the same year. In 2014, DJSI released the results of the assessment by announcing the top companies in 24 industry groups. Awardees included Siemens AG in Capital Goods; Unilever NV in Food, Beverage and Tobacco; and Kao Corporation in Household & Personal Products.

6.1.3 Report or Explain

In most cases, companies are faced with overlapping voluntary initiatives and mandatory regulations. For example, in India, government guidelines are designed to promote voluntary reporting and responsible business. However, Indian policy also dictates that the top one hundred publicly listed companies report their social and environmental impacts (UNEP 2014).

To promote compliance while allowing flexibility, an increasingly common practice in some parts of the world is the "report or explain" principle (GRI 2011). For example, this practice is included in Denmark's Financial Statements Act, which requires the largest companies to disclose sustainability information. The principle directs that companies should report where possible and explain if they are incapable of reporting on some issues. An inability to report may be due to limited capabilities or capacity to report at the time of compliance. However, the principle includes the expectation that reports will improve over time with increasing levels of disclosure through increased training and capacity in the area of reporting (GRI 2011). The practice became popular because of its flexibility and ability to allow companies to grow into high quality reporting practices, and it was highlighted at the Rio+20 United Nations Summit in 2012. However, allowing companies to "explain" can also be seen as a delaying tactic by which some companies can put off disclosing their impacts, especially if there are no penalties for non-reporting.

Businesses also receive pressure to report from stakeholders including consumers, investors, NGOs, or even their own employees. There is an increased awareness in civil society of the role of business in sustainability. Through social media and the Internet, environmental organizations have engaged consumers in their fight. Environmental NGOs push for transparency and accountability from companies (Buckley 2002). With both brand reputation and consumer loyalty at risk, companies (especially those that are consumer facing) are responding to this pressure.

In some countries, stock exchanges require companies to disclose environmental information. The Australian Securities Exchange (ASX) requires companies to disclose if they have environmental and/or social sustainability risks, while the Swedish OMX reserves the right to delist companies that have social and environmental violations (INI 2014). In addition, in cases where reporting is growing within an industry, a company may report to avoid being seen as a laggard (MacLean and Rebernak 2007). Whether companies are faced with some or all of these pressures, many are complying with requests to disclose and report their environmental impacts. However, these disclosures vary widely in breadth and quality.

6.1.4 Variability of Reporting

Reporting companies disclose environmental information in several different ways: by publishing quantitative metrics, by comparing performance with set targets, through third-party verification, and by means of environmental cost accounting (OECD 2003).

Table 6.1 Examples of major standards and reporting organizations

Standards and reporting orgs.
CDP
Water Disclosure Project
Connected Reporting Framework
Energy industry sustainability reporting guidelines
Forest Footprint Disclosure Project
Global reporting initiative's sustainability reporting guidelines
Greenhouse Gas Protocol
International integrated reporting committee's integrated reporting framework
International standards of accounting and reporting
UN Global Compact communication on progress
Environmental management and audit scheme
International finance corporation's policy and performance standards on social and environmental sustainability
International Organization for Standardization (ISO) 14000
OECD guidelines for multinational enterprises

In reporting, most companies only account for their own operations, not for the entire supply chain. Many critics of standard reporting suggest that assessments scoped at the company level misses far too much and does not account for the supply chain at all (Ethical Corporation 2013). Some suggest this oversight can be eliminated through full product transparency, which is often seen as the future of reporting. Using this method, a company must report the impacts at every phase of the supply chain for each product. Companies can account for the full life cycle of their product through a life cycle assessment (LCA), which is a methodology to meticulously enumerate and aggregate the various impacts of a product at each stage of its life cycle (see Sect. 6.2 for more on practices). Full transparency onto a product's life cycle would, in effect, achieve the highest level of transparency for reporting. However, many companies are reluctant to take on this challenge due to the significant time and expense of the analysis.

There is momentum toward global standardized reporting. Some barriers, however, exist to standardization. These barriers range from limited know-how, to data collection time constraints, to the multiplicity of standards and platforms. Additional staff or increased training may be required to take on the new task of collecting, analyzing, and reporting data. Even if there is support, appropriate systems may not be in place to collect the data. Executive support and time allocation to review and approve reports may be limited. Moreover, additional time and costs are also embedded in preparing the report and having it verified or audited for legitimacy.

The multiplicity of competing reporting standards and organizations also works against the goal of reporting (see Table 6.1 for a snapshot of some examples of this multiplicity). Different content, requirements, and audiences challenge businesses

to select and commit to a reporting format. However, in recent years, some of the main reporting mechanisms—including the GRI, the CDP, and the United Nations Global Compact—have made efforts to align information required to facilitate translation between standards (UNEP 2014). Initiatives like these are contributing to better alignment for corporate standardized reporting.

6.2 Methods of Disclosing and Reporting

Companies can take a variety of routes to disclose and report their environmental impacts. The method for how to assess and what to report is based on a company's preferences. The most popular method is the CSR report as a supplement to the company's annual financial report. Some companies use general and area-specific protocols and guidelines to formulate their reports, including the GRI, the Greenhouse Gas Protocol, and the Water Footprint Network (WFN). Protocols guide how and what to assess and report. Once a company has assessed its impacts, corporate decision makers can then choose to report solely through their individual reports or to disclose their impacts through a variety of platforms. The GRI serves as both a set of guidelines and a reporting platform for general sustainability indicators. For carbon reporting, the CDP and SmartWay serve as reporting platforms. For water, the WFN serves as the protocol to assess water and wastewater, while the CDP serves as a platform for reporting.

6.2.1 Firm Reporting

CSR reports have been and are the traditional way for companies to voluntarily disclose information to a variety of stakeholders about their non-financial performance. CSR reports not only disclose social and environmental activities, they may also recognize achievements by employees beyond their day-to-day responsibilities. CSR reports are very often "free-form"; a company can choose to include any activity it considers worth sharing with external and internal stakeholders. CSR reports are also marketing-driven and not necessarily connected with firm operations or the corporate mission.

Most companies report some quantitative metrics that serve as indicators for their environmental impacts. These metrics may be potentially comparable across an industry if peer companies use the same metric. The metrics might cover CO_2 emissions, water usage, waste generation, and others. Companies may also create targets and goals. For example, Johnson and Johnson, a health products company, proposed to achieve a 20 % absolute reduction of facilities CO_2 emissions by 2020, from a baseline of 2010 (Johnson and Johnson 2014). This makes it easier for external stakeholders to gauge progress relative to the metrics the companies are report-

ing. In addition to the most common practices of environmental metrics and target setting, companies may also engage third parties to verify their reports and validate their accuracy with organizations such as Trucost (Trucost 2014).

A final method of reporting is environmental cost accounting. This means that the companies also include information on financial and non-financial costs and benefits of a company's environmental strategy (OECD 2013). For example, General Motors reported saving $1 billion a year through reuse and recycling of by-products through waste avoidance (Triple Pundit 2012).

The type and breadth of information shared in CSR reports varies widely. For example, Seventh Generation, an environmentally focused homecare company, includes information ranging from product formulas and data on environmentally sensitive materials sourcing to community engagement information (Seventh Generation 2013). The report covers goals set by the company, highlights its progress towards these goals, and provides qualitative coverage of environmental and social action throughout the company.

On the other hand, CSR reports can be quite limited, and their quality can vary greatly over time. In 2010, British Petroleum (BP) released a sustainability report that addressed its role in the Gulf of Mexico Oil Spill without reporting the extensive environmental consequences of the amount of oil spilled in the gulf. The report also failed to disclose the amount of CO_2 or methane released as a consequence of the spill, and it only set forth a single and vague environmental goal (BP 2010). Furthermore, the report included minimal stakeholder input. Although BP's report was considerably lacking, the oil and gas giant had actually been long considered a leader in reporting, releasing one of the first major sustainability reports in 1998. BP also received reporting awards in subsequent years (Triple 2015).

Other companies opt to commit to many different goals; for example, Marks and Spencer proposed 100 different commitments that it reports on annually. These commitments include, but are not limited to, improving building energy efficiency, reducing food waste, and achieving zero-carbon operations. The 2014 report highlighted company goals and the annual progress achieved on each. That report disclosed that 12 commitments were incomplete, 9 were fully achieved, and 79 were on track to be finished by the proposed deadline (Marks and Spencer 2014). For example, the goal that 50 % of cotton used would be sourced sustainably by 2020 had achieved a rate of 20 % by 2014. Marks and Spencer's UK emissions totaled 533,000 t of CO_2 in 2014, down from 698,000 t in 2006; this represents an overall reduction of 37 % with a final goal of carbon neutral operations in 2020. The company's zero-waste-to-landfill-in-operations goal was achieved and maintained through 2014 with 100 % of waste recycled, despite an 11 % increase in waste production that year.

While most companies release their own sustainability reports, they also participate in a variety of standardized reporting protocols and platforms to assess and communicate their practices. The GRI is the primary reporting initiative through which companies disclose social and environmental practices.

6.2.2 General Reporting Platforms

In an attempt to provide more structured guidance to CSR reporting, CERES launched the GRI in 1998. In 2001, GRI became a separate organization focusing on corporate social and environmental reporting. As of 2015, the GRI reported that 7546 organizations had a profile in its Sustainability Disclosure Database and that 18,744 GRI Reports had been filed (GRI 2014b).

As a part of its efforts, GRI defines metrics and provides guidance for reporting year to year. The GRI recommends a four-step process for defining report content (GRI 2013) that includes identification, prioritization, validation, and review. The identification process begins by considering the GRI aspect list, stakeholder concerns, and existing impacts. Following an analysis of these considerations, a company prioritizes these concerns by evaluating their individual significance to the organization and their influence on stakeholders; define thresholds of materiality to the company; and decide the coverage on the issue. The third step, validation, sets up the systems to collect and measure the information and translates internal data into digestible public disclosures. The final step is a review of the collected material, assessed with previously reported information, and preparation for the next round of reporting. This step-by-step process is detailed extensively in the GRI's "G4: Sustainability Reporting Guidelines," to help companies manage the process year to year (GRI 2013). However, it is largely up to each company itself to determine and implement strategies to improve its reported scores.

Unlike previous versions of the GRI's reporting guidelines, the G4 guidelines include supply chain disclosure as a major component. The boundary of what a company should report on is extended from just a company's individual operations to the full value chain to better understand where impacts occur both upstream and downstream. To visualize these impacts, the G4 guidelines recommend conducting a value-chain assessment to map some of the company's key products and/or services. During the mapping process, the company collects information about impacts at each stage of the supply chain. The data may be derived from the company itself or through the use of proxy data from life cycle management databases. To enable this increase in scope, the GRI initiated the Business Transparency Program that allows suppliers and smaller companies to report under the "umbrella" of a larger organization. The program supports the implementation of reporting within suppliers to manage risk and improve sustainability performance.

GRI facilitates comparison of corporate practices globally. The GRI's reporting framework outlines over 100 environmental, social, economic, and governance topics on which companies may report (See Table 6.2) (GRI 2013). Although the framework includes many topics from different focus areas, companies are encouraged to report only on those applicable to their business. Because of the framework's broader focus, companies often use their GRI report as a basis for their sustainability report. For example, Microsoft uses the 2013 GRI Sustainability Reporting Guidelines in the creation of its annual sustainability report (Microsoft 2014).

Table 6.2 GRI reporting framework topics (GRI)

Biodiversity
Location and size of land (owned, leased, managed) in or adjacent to protected areas and areas of high diversity value
Impacts of activities, products and services on biodiversity
Habitats protected or restored
Managing impacts on biodiversity
National conservation list species with habitats in areas affected by operations
Compliance
Monetary value of fines and total number of non-monetary sanctions for noncompliance to laws and regulations
Emissions, effluents, and waste
Total direct and indirect GHG emissions by weight
Other relevant indirect GHG emissions by weight
Reductions in GHGs achieved
Emissions of ozone-depleting substances by weight
No_X, So_X, and other air emissions by type and weight
Total water discharge by quality and destination
Total weight of waste by type and disposal method
And volume of spills
Weight of waste (transported, exported) deemed hazardous and percent of waste shipped internationally
Identity, size, protected status and biodiversity of water bodies and habitats affected by organization's discharges
Materials
Materials used by weight or volume
Percent of materials that are recycled
Energy
Direct energy consumption
Indirect energy consumption
Energy saved by conservation and efficiency
Provision of energy-efficient, renewable energy-based products and services; net energy reduction
Reducing indirect energy consumption; net energy reduction
Products and services
Mitigation of environmental impacts of products and services
Percent of products sold and packaging materials reclaimed by category
Transport
Environmental impacts of transporting goods and materials used for organization's operations and members of workforce
Overall
Total environmental protection expenditures by investment and type

6.2.3 Issue-Specific Reporting

Environmental disclosures via CSR reports, even when structured by GRI, are general in nature. When environmental topics gain prominence, specific guidelines that allow firms to perform more detailed reporting and disclosures and allow for benchmarking and credible target setting are often developed. These guidelines for reporting are commonly supported by reporting platforms that collect information and report it publicly in a centralized location. Although there are other competing protocols and platforms in the environmental reporting space, the following are those that have reached critical mass through the number of corporate users globally.

6.2.3.1 Carbon

Since the introduction of GHG emissions as a central component of the Kyoto Protocol of the United Nations Framework Convention on Climate Change, reporting of these emissions has become an increasingly common practice (United Nations 1998).

The Greenhouse Gas Protocol Corporate Standard is the main accounting tool for businesses to quantify their GHG emissions. Started as a partnership between the World Resources Institute and the World Business Council for Sustainable Development, the protocol divides emissions into three scopes (see Fig. 6.1) (Greenhouse Gas 2014). Scope 1 includes the emissions that come directly from company-owned operations. The second scope includes indirect emissions from the purchase of electricity, heat, or steam. The third scope includes all other indirect emissions including, but not limited to, activities that are not owned by the company—such as employee travel, waste disposal, outsourced activities, and production of purchased materials, customer impacts, and end-of-life product disposal. In many cases, about 80 % of a business' emissions occur in Scope 3 (WRI and WBCSD 2011).

Most companies are able to report on Scope 1 because they have control over the emissions in question. However, emissions in the Scope 2 and Scope 3 categories are difficult for companies to account for, measure, and report because most of the activities are not under their direct control; this is especially true in the case of Scope 3 (Blanco et al. 2014). To identify Scope 2 and 3 emissions, companies must rely on upstream suppliers and/or downstream buyers to understand the full life cycle impacts of their practices and goods (Greenhouse Gas 2014).

To calculate the emissions at each scale, "emissions factors" (the amount of direct or indirect GHG emissions of a given practice), companies may collect data that is specific to their practices. Alternatively, they can use generalized values available from the GHG Protocol to calculate impacts. With the ability to use generalized values for emissions amounts for certain practices or processes, a company can assess its Scope 1 emissions simply by collecting basic data from its own operations. For example, a company can collect data on the distance traveled by its trucks and use

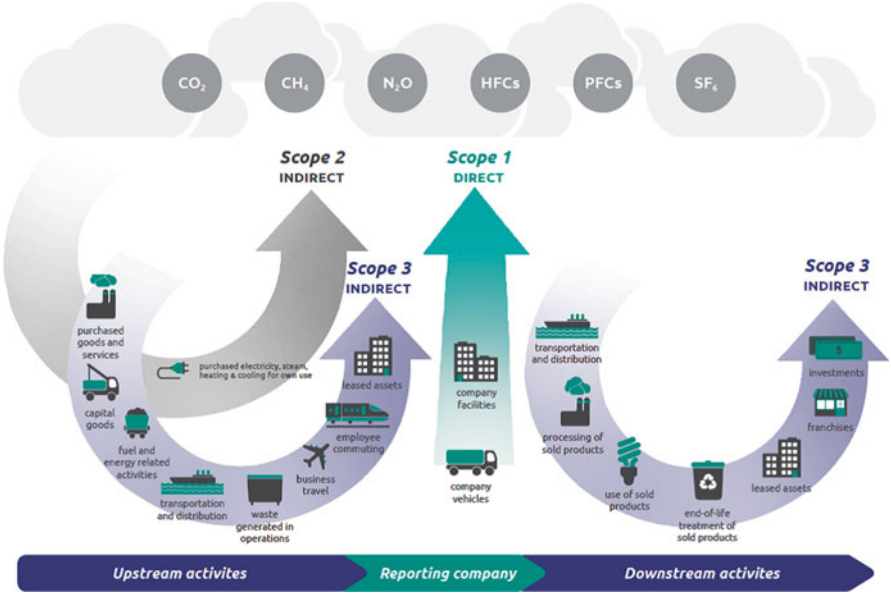

Fig. 6.1 GHG protocol emission scopes (*Source*: Fig. 1.1 in WRI and WBCSD, 2011)

this data to calculate emissions impacts using generalized values for vehicle emissions. The emissions factors are based on the best available data sets as determined by the GHG Protocol and are aligned with those used by the Intergovernmental Panel on Climate Change (IPCC), the internationally recognized body on climate change (Greenhouse Gas Protocol 2014). However, because practices can vary widely across time and region, the best emissions data is company-specific. Chapter 3 by Boukherroub et al. (2017) provides further background on carbon footprinting.

CDP

While the GHG Protocol serves as the reporting protocol, the CDP serves as a wider platform for emissions reporting. The CDP is a UK-based organization established in 2001 that enables large organizations to measure and report GHG. In 2002, the CDP sent out its first survey to engage companies in reporting; it received 221 responses from 500 surveyed companies (Winston 2010). Twelve years later, in 2014, the number of reporting companies had increased to 5003 (CDP 2015a, b, c).

For its reporting requirements, the CDP utilizes assessment guidelines and scope definitions outlined in the GHG Protocol. In recent years, it has expanded to include water, climate risk, and supply-chain wide reporting. The annual questionnaire includes over 100 questions spanning the range of emissions-producing activities. The findings are released every September along with two additional indices: the Carbon Disclosure Leadership Index and the Carbon Performance Leadership

Index, which acknowledge increasing levels of transparency and the greatest GHG reduction over previous years across reporting companies. Such reporting rankings may provide motivation for companies to continue to report and strive to match reductions of their peers.

An important feature of the CDP is that it contacts companies to report on behalf of investors. When a company reports to the CDP platform, it provides investors an annual resource of environmental impacts that "supports long-term objective analysis" (CDP 2015a). The CDP investor initiatives include 822 institutional investors with $95 trillion in assets under management (CDP 2015a). With pressure from investors, companies are encouraged to measure, disclose, and manage their emissions. In this way, investor pressure is playing a role in total emission reductions.

The CDP has also taken a step further into supply chain disclosure with its supply chain program. The program works with buyers and suppliers to collect GHG emissions data information from the suppliers. In Europe and North America, 64 companies currently participate in the program, and the CDP supply chain program facilitates reporting from 5600 of their suppliers (CDP 2014b). The CDP designs and circulates a survey to assess the practices of the suppliers. This survey includes a 17-page questionnaire with 86 questions on issues including climate change risks, management, strategy, and policy. In 2013, of the 5600 suppliers surveyed, 2869 responded (CDP 2014b). This initiative helps to expand the system boundary of environmental reporting from companies to their supply chains. In most cases, however, the survey only addresses Tier 1 suppliers, even though global supply chains tend to be at least five or six tiers deep.

EPA SmartWay Program

In the case of logistics, the U.S. EPA's SmartWay Program serves as the main reporting platform in the U.S. The SmartWay program was created in 2004 to reduce environmental impacts across the goods movement industry. As a collaborative initiative, it brings together shippers, carriers, logistics service providers, and governmental entities. Shippers range from food companies like Chiquita to retail stores like Whole Foods. The program started with 15 motor carriers but has grown to 3000 in 2014, with major carriers such as Ryder and C.H. Robinson reporting to SmartWay (SmartWay 2014).

SmartWay provides tools to measure and report the impact of logistics carriers over time. Shippers use the assessments to select high-achieving carriers and to gauge progress over time. To measure their impact, carriers collect data from their operations such as miles driven, fuel used, vehicle model year, and cargo payload (EPA 2013). Using the SmartWay-provided tools together with their activity specific data, carriers calculate their environmental performance in grams-per-ton-mile or gram-per-mile emissions. Following the assessment, the carrier's information is publicly reported and ranked within its sector. SmartWay conducts random quality checks on reporting carriers to encourage accuracy in reporting.

In recent years, shippers began to commit to increasing the share of their freight moved by carriers that are SmartWay certified. This emphasis on certification provides market incentive for carriers not only to measure and report, but to reduce their environmental impacts relative to their peers. SmartWay also offers tools for benchmarking, vehicle environmental rankings, and guidance on how to replicate a SmartWay-style program internationally (SmartWay 2014).

6.2.3.2 Water

The WFN serves as a framework to calculate an organization's water footprint across the supply chain in the production of its goods and services. The WFN defines a water footprint as the "volume of freshwater used to produce the product, measured over the full supply chain" (Hoekstra et al. 2011, also Chap. 4 by Hoekstra (2017)). A water footprint includes information about volumes of water by source geographically and temporally. It further distinguishes water consumption in terms of blue, green, and grey water, which are defined as surface and groundwater, rainwater, and polluted water, respectively. As with many assessments, the water footprint is based on a focus area the company selects. For example, an assessment can focus on a specific process step within the supply chain or on the total water footprint of a final product; it can also assess the footprint of a specific producer or an entire economic sector (Hoekstra et al. 2011).

In 2010, the Coca Cola Company released a report entitled, "Product Water Footprint Assessments" (The Coca Cola Company 2010). To inform its sustainability water use goals with a comprehensive water footprint analysis, the global beverage company assessed indirect water use in its supply chain by accounting for packaging and ingredients, while also assessing direct operational water use in its bottling plants. The analysis revealed that the water footprint associated with the production of a half-liter of Coca Cola in Dongen, the Netherlands, equated to 12 L of grey water, 15 L of green water, and 8 L of blue water. From this assessment, Coca Cola was able to determine that two-thirds of the water footprint for that particular product was related to using blue and green water to grow sugar beets for drink ingredients, while one-third of the footprint was related to grey water effluents from the supply chain, which included nitrogen in the fertilizer for the beet field and the cooling water for PET production (The Coca Cola Company 2010). This indicated the company that a greater focus on sugar beets was important to address impacts on its water footprint.

At the time of this writing (2015), most companies were reporting their water footprint individually through their own websites or corporate sustainability reports; for example, Coca-Cola's water footprint is presented on a sub-domain discussing its efforts within its corporate website. Given the absence of a neutral water reporting platform, the CDP, in addition to its role as a carbon reporting platform, initiated a program to serve as a central water impact repository.

While the CDP is most known and used for its carbon reporting platform, CDP's water program is becoming increasingly utilized by companies and organizations

alike to report their water impacts. Similar to its carbon questionnaire, which assists companies to collect relevant carbon impact information, CDP's water questionnaire provides guidance for companies to consistently assess, report annually, and act on their water impact (CDP 2015b). This allows investors to include a company's annual water performance in their decision making.

6.2.4 Product Level

If a company is working to achieve higher levels of environmental sustainability in the production of a product, it may include a label with environmental information to inform its consumers of its activities. These labels are sometimes called eco-labels. Eco-labels range widely in the areas they address, rigor of certification, categories and issues covered, and region of applicability. These multiple factors increase the challenges for both the company and the consumer. Additional voluntary labels, such as the Rainforest Alliance Certification that identifies socially and environmentally conscious farming practices, are also used.

Other voluntary labels offered by environmental organizations require companies to provide information about the supply chain in order to receive certification. For example, the Rainforest Alliance Certified™ Seal indicates that products are made from ingredients sourced from farms using the standards of the Sustainable Agriculture Network (Rainforest Alliance 2014). These standards include practices that protect local environments, workers, wildlife, and the communities from which materials are supplied. The seal indicates that the company has traceability to ensure verified practices.

Once this information has been vetted by the Rainforest Alliance, the company can place the seal on its products to indicate that the products include ingredients that are made with superior environmental and social practices. Another example is the Forest Stewardship Council Certification (FSC). FSC-certified products are made from materials sourced from forests managed using FSC Principles and Criteria. These criteria include maintaining high conservation value forests (HCVF), conserving resources such as biological diversity and water, and promoting social principles such as the protection of indigenous people's rights (FSC 2014).

There are also government-mandated labels, such as the US EPA's vehicle MPG (miles per gallon) label that indicates fuel efficiency. A newly updated label released by the US EPA in 2011 requires that information to inform consumers about smog and greenhouse gas tailpipe emissions on a 1–10 scale appears on the label (US DOE 2011). In addition to environmental impact ratings, this label also provides an MPG rating for city and highway driving and estimates the fuel cost savings for cars with better MPG than the average-performing car. The objectives of this label are to increase consumer awareness and preference for cars with better environmental performance and encourage the car market to support this demand.

When deciding whether or not to pursue any type of labeling, a company must first decide whether it is worth the time, effort, and expense of obtaining some form

of label. This question may arise because some consumers may have no knowledge of or interest in the label's disclosures. For example, a 2010 study by Delmas and Grant showed that wine producers featuring the USDA Organic label on their bottles actually had to reduce their selling prices to get consumers to buy their products (Delmas and Grant 2010). This may be due to a perception that organic wines are of lower quality. However, in other cases, the high recognition and regard for a label by local consumers may allow a company to gain a price premium for its products. For example, Bjørner et al. (2004) found that consumers in Denmark were willing to pay 10–17 % more for toilet paper labeled with the Nordic Swan certification, a local multi-criteria environmental label. This demonstrates that a company must think strategically about potential price and reputation benefits, if any, prior to obtaining a label.

A majority of labels represent sustainability at only one phase or dimension of the supply chain. For example, the MPG label only accounts for the environmental impact at the consumer use phase of driving the automobile but indicates nothing about the impact of the manufacturing processes or vehicle recycling. The USDA organic label informs the consumer that produce has been farmed organically but gives no information about the transportation impacts from farm to store or whether virgin forest was destroyed to make the farm. Some labels seek to inform the consumer about the full life cycle carbon, water use, or waste impacts of a product across the supply chain, from materials to manufacturing to transportation. The Carbon Trust is one organization offering a label of this type, called the Carbon Footprint Label (Carbon Trust 2015). The Carbon Footprint Label displays the total carbon impact of a product over its entire life cycle. The Carbon Trust also offers certification that discloses total water usage, management, and effluent, as well as waste management and disposal. A company can inform consumers about the total impact of a product, such as grams of CO_2 produced, with a measurement label. The company can also communicate to consumers that it has reduced the overall footprint of that product with a reduction label. To attain this level of disclosure, a company must assess the impact of its products through life cycle assessment.

6.2.4.1 Life Cycle Assessment

For companies that want to take disclosure a step further, a Life Cycle Assessment (LCA) offers deep insight into the environmental impacts of a company's products. (See Chap. 2 by Guinée and Heijungs (2017) for a comprehensive introduction to LCA.) This rigorous assessment tool accounts not only for the company's environmental impacts but also for those of its upstream suppliers and downstream buyers to provide the fullest depth of detail possible. LCAs became widely used in the 1970s and 1980s, during a period of growing environmental awareness and an energy crisis. However, when manufacturers began to calculate LCAs for their products, they often used varying methodologies that had not been scrutinized or validated, and assessments were often manipulated to support a preferred outcome. To overcome this, the International Organization for Standardization (ISO)

introduced a standardized LCA methodology in 1997 (ISO 2006). The LCA methodology includes four steps that are designed to account for a product's total environmental impact.

The LCA's four steps include: goal and scope definition; inventory analysis; impact assessment; and interpretation. The Goal and Scope Definition element informs a company about the system boundary of its product. Inventory Analysis facilitates the collection of data for all inputs and outputs of a final product and its end of life. Impact Assessment uses the collected data to calculate the specified inputs and outputs, and Interpretation provides a discussion of the analysis results, highlighting limitations and recommendations as related to the original goal of the study (ISO 2006).

If a company wants faster results, software systems such as SimaPro (Pre Sustainability 2014) and GaBi (2014), which use databases that draw from generalizable data sets for specific activities such as Ecoinvent (2014), are often used to conduct an LCA. An LCA provides insight into the greatest sources of impact along the supply chain. However, the practice incorporates some sensitivity flaws when generalized data sets or incorrect assumptions are used.

Although the Life Cycle Assessment offers a more complete picture of a company's impacts across its supply chain, the findings go largely unreported. Many companies use the tool primarily to obtain information about which areas in their supply chain offer the greatest opportunities to reduce environmental impact. Companies also may not report their results because they believe that the complex nature of the information would not be generally understood by the public.

6.3 Environmental Reporting Strategy

The practice of reporting helps a business understand its impact and seek appropriate action to minimize this impact. To effectively manage impact reduction over time, companies must set up a regular reporting cycle, which includes collection of data, communication of results, and external feedback (GRI 2014a, b). If reporting is regular, then environmental actions are more closely monitored and evaluated, which can make them more successful. In addition, this process keeps all stakeholders, both internal and external, informed. Internal alignment with reporting can engage company executives to help align sustainability with company strategy.

6.3.1 Decision to Report

In many cases, companies are leading the way by reporting without the pressure of regulation. They report to contend with competitors or to satisfy stakeholder pressures. Although companies are proactively disclosing, internal practices are not always aligned to support robust sustainability reporting. Much data collection continues to be ad hoc, with a few individuals gathering necessary information from

around the company through emails and Excel spreadsheets. Some software solutions are emerging through organizations like Enviance (2015) and Systems, Applications and Products in Data Processing (SAP). SAP is a German multinational software corporation that developed the Product Stewardship Network (2015) to assist corporations with their reporting. Intelex and the EHS Regulatory Documentation OnDemand offer similar software solutions (2015). These tools allow a company to track environmental data across the company or products; some also manage regulatory limits as applicable to the company. Although helpful, these software solutions have limitations in terms of supply chain scope, training requirements, compatibility with enterprise systems, and cost. The variability in data collection also influences the content of reports.

In addition, the scale of reporting does not always indicate quality or accuracy. For example, research commissioned by the European Union indicated that, although companies operating in Europe are releasing environmental reports, the information may be lacking in substance (Wensen et al. 2011). The information provided is incomplete and selective, designed only to show positive company practices, and the information provided may be skewed. The report goes on to say that regulation of sustainability reports may improve the content and accuracy of the reports and standardize reporting across companies (Wensen et al. 2011). In addition to the challenges of selective representation and accuracy, reports tend to have a limited focus. As previously noted, because a company only has direct control over and visibility into its own operations and little leverage to account for and manage upstream suppliers and downstream buyers, supply chain impacts are largely absent from the reports.

Companies are increasingly interested in understanding the impacts of their supply chains, either voluntarily or because they are required to evaluate them by pressure or mandate. However, the practice of supply chain assessment beyond a company's direct operations brings numerous additional challenges. In many cases, in order to obtain the information required to account for the full impact of the supply chain, companies send out questionnaires, surveys, or scorecards to their suppliers. These documents ask the suppliers to report their environmental impacts and to allow the requesting company to gauge their full impact. This initiates what is sometimes referred to as the "survey waterfall": when the initiating company requests information about a supplier's practices, it must also survey the supplier's suppliers, and so on. Often, suppliers may lack the knowledge or tools to conduct such an assessment. In some cases, the requesting company will support its suppliers in learning how to audit their practices. For example, when Siemens' started to assess its suppliers and their energy use in an attempt to reduce its total carbon footprint, it provided both training and a methodology for suppliers (Siemens 2012).

In other cases, specific industries have developed a standard questionnaire. For example, the electronics sector offers the Electronics Industry Citizenship Coalition Self-Assessment Questionnaire (EICC 2014). The pharmaceutical industry developed the Pharmaceutical Supply Chain Initiative Self-Assessment Questionnaire (Pharmaceutical Supply Chain Initiative 2013). These industry initiatives are ben-

eficial because they reduce the burden on suppliers to respond to differing requests for information from various buyers; they also provide a clear standard and guidance for reporting and offer tools to address environmental challenges.

6.3.2 The Role of Third Parties in Reporting

In cases where there is no industry standard, or where a company has limited capacity to contact its supply chain partners, a third party may be engaged to conduct environmental data collection. Designed initially around risk management issues, organizations like EcoVadis now additionally focus on environmental reporting. EcoVadis' primary role is to collect information from suppliers on behalf of its customers. To do this, it sends a questionnaire to suppliers that includes questions on topics ranging from child labor to carbon emissions, as requested by the customer. EcoVadis then manages the entire information-gathering process—from crafting the questions to following up on non-responsive suppliers to obtain data a company needs to assess its supply chain impacts (EcoVadis 2014). It also asks for documentation from suppliers to support answers and data provided.

EcoVadis and other such companies serve as intermediaries between companies needing to collect relevant data and their suppliers through reporting platforms. Platforms of this type can be beneficial to both buyers and suppliers. Buyers have an organization collecting the necessary data for them, and suppliers have a repository for their information from which to draw for other requesting buyers. In addition, if they so choose, suppliers can make information about their environmental practices public so other buyers may source from them if their practices are better than those of their peers. However, when engaging a middleman like EcoVadis, suppliers are assessed a fee to use these services and maintain their relationship with their buyer.

6.4 Future of Reporting

Although many driving factors have led to increased environmental reporting from companies internationally, the business impact of disclosure is still unclear. The motivations that drive reporting are often regulatory compliance, risk mitigation, and brand positioning. However, if reporting can be linked to increasing corporate value, the case for more widely spread and higher quality reporting can be made. Existing challenges that continue to prevent greater adoption of reporting include the time, cost, and limited benefits associated with reporting (Wensen et al. 2011). Further identification of clear boundaries, areas of focus, quality, and value to the company will increase motivation to report for companies of all sizes and across jurisdictions.

6.4.1 Future Trends

Several trends can be seen in the future of reporting. The first is the consolidation and standardization of various disclosure paradigms and reporting schemes used by companies. Currently, companies face multiple mandatory and voluntary standards, and additional (often different) organizations exist to which companies report. Not only are standards sometimes unconnected to reporting mechanisms, but they also address different issues (carbon, water, deforestation, social). Furthermore, they may have different geographical scopes, such as state (California), national (United States), regional (European Union), or global. This multiplicity impedes high-quality reporting practices at companies, and it also confuses external readers of the reports: the different forms of reporting can overwhelm even the most conscientious environmentalist.

The next major trend is the shift from company-wide to supply chain-wide reporting. As previously discussed, upstream and downstream impacts are not currently included in most reports. Preliminary assessments are conducted on a limited and private scale; this includes the increasingly common practice of LCA to assess the full impact of a product. At this time, the disclosure of LCA findings is not common. Reporting institutions such as CDP are beginning to address the supply chain issue through supplier questionnaires and other programs (Jira and Toffel 2013), but these only address first-tier suppliers. Although this practice may be limited, the findings are promising. A report commissioned by CDP found that suppliers who had several buyers requesting information were more likely to report (CDP 2014b). The next major challenge will be for companies and reporting institutions to engage the deeper tiers to increase supply chain transparency.

An additional reporting trend can be observed in new platforms for reporting, such as social media and e-commerce. Digital communications in the form of social media have become the modern venue for information sharing. The platforms can serve to inform other businesses, the investing community, stakeholder groups, and customers. This trend can be seen in financial reporting, and it was addressed by the Securities and Exchange Commission (SEC) in 2013 through guidance for public companies on the use of social media. The SEC's intent was to align companies with obligations under the federal securities laws (U.S. Securities and Exchange Commission 2013). As companies find it more relevant to disclose financial events through social media, environmental disclosure may also follow this route.

In addition to disclosures through social media, e-commerce platforms such as online shopping and B2B marketplaces may be a new channel for environmental disclosures. As online marketplaces have proliferated and become mainstream with websites like Amazon, so has the engagement of the consumer with web-based information presented via those marketplaces. Consumer reviews and ingredient disclosures represent two forms of this type of data. To further inform consumers, companies may use e-commerce platforms as an additional opportunity to present environmental disclosures. For example, eBay Inc. created a supplemental website specifically to offer products with positive environmental attributes under green. eBay.com (eBay 2015). These products have better environmental attributes and

more environmental disclosures than do their counterparts. This trend is likely to continue across other products.

The final major trend involves transitioning from merely reporting environmental impacts to also managing them. In many cases, companies are seeing reporting as a box to be checked. If they have reported their impacts and seen no major external feedback, their environmental engagement ends. If reporting is treated as a management tool, however, a business might be better equipped to identify key issues and to set appropriate goals backed by solid metrics (MacLean and Rebernak 2007). If reporting were linked with clear metrics to assess how company activities are creating environmental impacts, the rationale behind reporting could be strengthened.

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