

# A framework for sustainability reporting

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## Abstract

**Purpose** – A sustainability reporting framework must demonstrate that resources are fairly bought and used to support diverse life on earth within habitable ranges. The purpose of this paper is to propose a principle-based sustainability reporting framework that measures, audits and reports based on sustainability outcomes and impacts as part of the corporate reporting framework.

**Design/methodology/approach** – This paper draws on the United Nations Sustainable Development Goals (UN SDGs) and targets for preparing a reporting framework. It uses Gaia Theory and the Theory of Distributive Justice constructs that align with sustainable development principles to delineate a reporting approach.

**Findings** – Frameworks that promote sustainability reporting have increasingly embraced UN SDGs but overly focus on performance promoting inter-firm comparisons. This framework introduces principle-based sustainability reporting where firms demonstrate their chosen contribution to sustainable development using 17 UN SDGs as goal posts.

**Research limitations/implications** – This conceptual paper presents theoretical constructs that future research can empirically validate to enhance sustainability reporting.

**Practical implications** – This principle-based sustainability reporting framework is implementable for corporate reporting, where sustainability reporting integrates with the financial and economic intellectual capital reporting frameworks.

**Social implications** – This framework highlights the importance of acquiring and using resources to distribute justice and fairness. It is a joint project between firms and stakeholders.

**Originality/value** – This framework promotes integrated thinking for firms to engage in principle-based sustainability reporting and provides a roadmap for sustainability reporting using the SDG Compass logic model.

**Keywords** Gaia theory, Sustainability reporting, United Nations Sustainable Development Goals, UN SDGs, Theory of distributive justice

**Paper type** Conceptual paper



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## 1. Introduction

The KPMG survey on firms' sustainability reporting shows that in 1993, 12% of the top 100 companies in 52 countries engaged in sustainability reporting, and in 2020, it increased to 80%. In 1997, 35% of the world's largest 250 companies by revenue listed on the Fortune 500 engaged in sustainability reporting, and in 2020, it increased to 96% (Threlfall *et al.*, 2020). During these periods of firms increasingly embracing sustainability reporting, the US environmental policy impact shows that water and air pollution have followed a decreasing trend, while greenhouse gas emissions have followed an increasing trend. The reduction in water and air pollution is attributed to more significant benefits than costs incurred, whereas firms have not decreased greenhouse gas emissions because costs were more than benefits accrued to them (Shapiro, 2022). Chouinard *et al.* (2011) point out that absorbing otherwise externalised costs into the cost of production makes firms less competitive. These trends point out that the financial implications to firms in adopting sustainability practices are core to their decision-making.

Embracing sustainability as an integral plan in a business model has been challenging for firms. Although it is widely acknowledged that sustainable ecosystems are becoming a necessary condition for organisational continuity, nevertheless, firms' sustainability reporting trends have not kept pace with addressing sustainability-related issues. These issues are related to economics, the environment and society. For instance, since the 1970s, firms' productivity gains that show higher living standards have grown by 59.7% allowing firms to compensate for labour productivity, but the labour productivity of a typical worker has grown by only 15.8%. The disparity between firm productivity gains and labour productivity growth rates has led to increasing inequity between different worker groups, owners and workers (Fleck *et al.*, 2011; Mishel, 2021).

Sustainability reporting aims to demonstrate contribution to sustainable development (Beyne *et al.*, 2021). Throsby (2017) identifies five principles that guide sustainable development. They are: intergenerational equity (peoples of different generations have the same advantages from resources); intragenerational equity (peoples of the same generation have the same advantages from resources); the importance of diversity (diverse processes are required for economic, social and environmental development towards diverse life); interconnectedness (economic, social and environmental systems are interconnected and cannot be treated in isolation) and taking precautions against human actions that can lead to irreversible results on sustainability.

In reporting about the five sustainable principles guiding sustainable development, an output is a measurement artifact such as a number, but an outcome is the difference that output has made to uphold sustainability principles. According to Pucker (2021), firms typically report on sustainability outputs rather than outcomes after undertaking sustainability activities and report economic, social or environmental outputs in isolation. Mills-Scofield (2011) points out that sustainability reporting should focus on the impact made on sustainability outcomes. An impact indicates the specific changes that occurred because of the outputs to sustainability principles (UNGC, 2015).

Companies should focus their sustainability reporting on outcomes and impacts to inform stakeholders about executing the rightful duty to take care of the planet and sacrificing profits because of internalising costs to benefit the society and environment. Companies measure sustainability activity outcomes and impacts and audit information generated using various methodologies (Pucker, 2021). However, the current emphasis by the International Sustainability-related standard-setting bodies is to encourage firms to produce reports that lead to consistent and comparable information about their sustainability outputs.

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This article builds its framework benefitting from previous research undertaken in this direction to integrate sustainability reporting with the corporate reporting framework. [Adams \(2017\)](#) examined the Integrated Reporting framework regarding integrating UN sustainable development goals (SDGs) in the reporting, broadening the agenda of value creation outcomes to cover the six aspects of capital (financial, manufactured, intellectual, human, social and relationship and natural). A given SDG can fall within more than one aspect of capital. In that, the report argues that reporting about these goals is for investors (such as superannuation and insurance funds) that take a long-term outlook.

[SDG Compass \(2015\)](#) is another roadmap provided to firms for integrated thinking to aid reporting on UN SDGs. They show a logic model for firms to understand their contribution to SDGs by going through five steps: inputs (what resources are positively or negatively linked to SDGs?), activities (what activities were undertaken?), outputs (what these activities generated?), outcomes (what changes or difference occurred to the sustainability principles in the target population?) and impact (what changes occurred because of the outputs?). The Global Reporting Initiatives (GRI), the UN Global Compact and the World Business Council for Sustainable Development jointly developed SDG Compass ([SDG Compass, 2015](#)). It proposes firms map their UN SDGs by reporting over the value chain (raw materials, suppliers, inbound logistics, company operations, distribution, product use and product end life). Value chain analysis enables firms to maximise value for consumers competitively. However, sustainability reporting using value chain analysis is complex because suppliers may not be equally committed as the firm and lack knowledge in creating SDG-related outcomes and impacts for the firm ([Dwivedi et al., 2021](#)). There are organisational challenges for firms in emerging nations to capture consumer taste, social and environmental outcomes and impacts ([Sassanelli et al., 2020](#)). In these countries, governments and citizens have to accept more responsibility for the negative externalities of firms, such as hazardous waste generated through product designs and recycling ([Zorpas et al., 2021](#)). [Whittingham et al. \(2022\)](#) examined the normative pressure exerted by SDG Compass on top-performing firms of the S&P Global Sustainability Yearbook on sustainability reporting using UN SDGs and found not all these firms are choosing their reporting agenda and many that do are not engaging systematically, requiring further guidance on a sustainability reporting framework. In reviewing strategic tools and reporting, [Grainger-Brown and Malekpour \(2019\)](#) identified that the 17 UN SDGs are challenging to firms requiring guidance on reporting as part of their strategy development and organisational action.

It is in these lights that this paper aims to present a sustainability reporting framework that shows the interconnection between financial capital, economic intellectual capital and sustainability capital through sustainability reporting. Further, sustainability reporting identifies the outcomes and impacts of contribution to environmental capital, social capital and sustainability-related intellectual capital. The framework also emphasises a consistent measurement methodology of outcomes and the importance of independently audited information. Intellectual capital is the stock of comprehensive knowledge ([Augier and Teece, 2005](#)). Social capital is the stock of people's relationships that reciprocally bond with obligations based on norms ([Bourdieu, 1986](#), p. 248). Environmental capital is the stock of renewable and non-renewable resources ([Throsby, 1999](#)).

The following section presents the literature that paves the way for presenting a sustainability framework. The theory section introduces Gaia Theory and the Theory of Distributive Justice, leading to a principle-based, outcomes- and impacts-led sustainability reporting framework. Section 4 presents a corporate reporting framework that integrates the sustainability reporting framework. The last section contains some final remarks.

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## 2. Relevant literature

Sustainability takes its roots in sustainable development – meeting the present needs of this generation without depriving future generations of the capacity to meet their needs. In 1987, the Brundtland Commission released a report prepared by the United Nations (UN) World Commission on Environment and Development to bring forth long-term environmental strategies to attain sustainability by 2000 and after (Brundtland Commission, 1987).

Sustainable development refers to pathways to reach the goal of sustainability. There are several pathway agreements: Climate Change (Article 6 of the UN Framework Convention on Climate Change), Biodiversity (Article 13 of the Convention on Biological Diversity), Disaster Risk Reduction (Sendai Framework for Disaster Risk Reduction 2015–2030) and Sustainable Consumption and Production (Sustainable Lifestyles and Education Programme of the 10-Year Framework of Programmes on Sustainable Consumption and Production 2012–2021) (UNESCO, 2021). However, the previously set pathways to attain sustainability by 2000 did not eventuate. Later, it became clear that pathways require setting one or more specific goals to achieve sustainability on earth. In 2015, the UN set 17 sustainability benchmark goals to attain by the year 2030, and these 17 UN SDGs are critical dimensions for this study.

The GRI framework for sustainability reporting is the most widely used sustainability reporting framework (Isaksson and Steimle, 2009). GRI claims over 10,000 GRI framework reporters across 100 countries (GRI, 2021). More than two-thirds of the top 100 companies in 52 countries are engaged in sustainability reporting. More than two-thirds of the world's largest 250 companies by revenue listed on the Fortune 500 have used the GRI framework. The GRI framework has sought guidance from the Global Sustainability Standards Board, that have set GRI standards for sustainability reporting (Threlfall *et al.*, 2020).

Alonso-Almeida *et al.* (2013) point out three reasons firms adopt the GRI reporting framework: to build relationships with stakeholders, to avoid stakeholder pressure for not reporting about sustainability and to show that firms are doing the right things to attract investors. After considering the propositions contained in the Triple Bottom Line, Eco-Efficiency was launched by the World Business Council for Sustainable Development, Global Compact and The Natural Step. Isaksson and Steimle (2009) criticised the GRI framework for not considering customer needs for reporting purposes, falling short of ascertaining how sustainable a firm is, and pointed out that it is difficult to determine how quickly a firm can become a sustainability firm using a GRI framework.

The GRI is a sustainability reporting framework that focuses on outputs rather than outcomes and impacts. A firm that genuinely performs with sustainability should not only demonstrate meeting its targets with often monetary contributions but also show the difference that the firm's efforts have made to the planet (Pucker, 2021). The GRI framework uses reporting principles: accuracy, balance, clarity, comparability, completeness, sustainability context, timeliness and verifiability. The framework enables these underlying principles with standardised reporting indicators (GRI, 2021).

Cardoni *et al.* (2019), using the oil and gas industry as a case example, have shown that using the GRI framework does not lead to sustainability reporting comparability. They state it is because larger firms are under stakeholder pressure to disclose more information, diverse boards influence reporting practices or normative rules of a country can affect sustainability reporting. They found that of the 51 relevant GRI indicators, only 4 are commonly used and reported in the oil and gas sector. Only 75% of firms commonly used the four indicators. The industry did not commonly use the remaining 47 indicators, demonstrating that industry-sector reporting does not necessarily lead to increased comparability. Al-Shaer *et al.* (2022) found that firms differ in their sustainability reporting

because of numerous factors: external factors such as the report underwent external assurance or ownership concentration; internal factors such as board quality or the presence of a sustainability committee; and reporting behaviours such as financial reporting quality. The influence of this wide variety of factors can reduce reporting comparability.

The GRI sustainability reporting uses three series of GRI sustainability reporting standards (universal, sector and topic) to transparently show how firms have contributed (or aim to do so) toward sustainable development (GRI, 2022). Fonseca *et al.* (2014) state that the indicators included in GRI for reporting purposes are not integrated and require responding to backwardly looking reporting pressures. As a vision, GRI has overlooked that sustainability should operate within the biosphere's capacity. Quilice *et al.* (2018) pointed out that the framework comprises complex guidelines with ambiguity and flexibility for reporting. Previous studies have made various recommendations to rectify these weaknesses in the GRI framework. Among them, Utama (2011) suggested that the GRI framework should offer a global vision for the firm and that firms should release audited information. Siddall *et al.* (2013) proposed creating additional standards to develop more stakeholder engagement. Quilice *et al.* (2018) proposed to have more standardised GRI reports and create a more straightforward reporting system.

Although firms have widely adopted the GRI framework for reporting, there are two noticeable emerging trends. First, the GRI framework now incorporates the UN SDGs for reporting to shift the firm focus. Second, the firms are also increasingly voluntarily connecting their sustainability reporting activities with UN SDGs. In 2020, 69% of the top 100 companies in 49 countries surveyed and 72% of the world's 250 largest firms by revenue based on the Fortune 500 ranking did so (Threlfall *et al.*, 2020).

The GRI framework follows the triple bottom line principles of balancing the economic, social and environmental aspects, following an analytical approach to reporting in terms of the sustainability reporting approach (Grainger-Brown and Malekpour, 2019). On the other hand, UN SDGs focus on sustainably developing healthy societies with collective well-being (Grainger-Brown and Malekpour, 2019; Saxena *et al.*, 2021), following a holistic approach to reporting. Further, all UN member nations have agreed to follow the 17 goals toward sustainable development (Kroll *et al.*, 2019).

Although GRI states that it can be a standalone report or part of a single corporate report, the GRI sustainability framework is not integrated with the financial reporting and non-financial reporting frameworks (GRI, 2021). The GRI framework provides little guidance to firms reporting the interconnection of financial capital with other social, environmental and intellectual capitals relating to sustainable development. An integrated reporting framework is vital to show the interconnection of capitals to demonstrate firms' impact on the society and environment. Otherwise, firms can engage in sustainability reporting that internalises resources to support sustainable development, yet not get rewarded for taking a moral stand but are left alone with hurt profits.

The approach of internalising costs is inconsistent with the neo-classical approach to development that measures growth by firms' profits and the nation's gross domestic product. Hoff and Stiglitz (2001) point out that when market forces, technology and consumer preferences become less applicable for economic growth, the neo-classical economic approach blames governments for policy failures. The neo-classical approach aims to measure economic growth rather than economic welfare. In that economic approach, firms can include expenses that harm the five sustainability principles as favourable, as long as these externalities do not alienate property rights and have no transaction costs.

Kubiszewski *et al.* (2013) showed a close relationship between economic welfare and economic growth until 1978 with countries following the neo-classical economic approach.

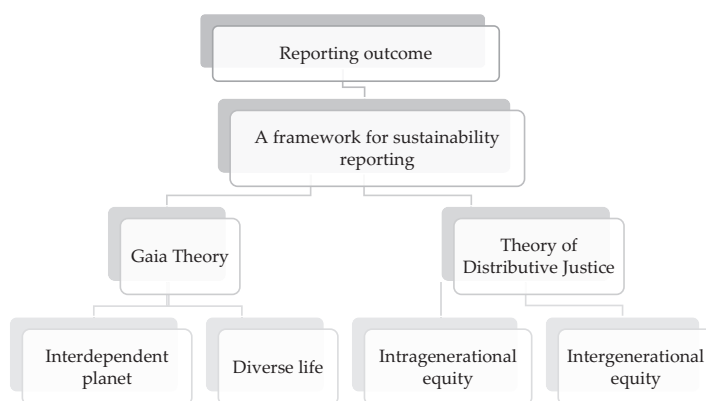
Actually, with the onset of the industrial revolution, the use of ecological resources started exceeding the earth's biological capacity. However, since the 1950s, economic growth has increased threefold, and since 1978, economic welfare measured using the Genuine Progress Indicator has decreased. To rectify this situation, firms internalising otherwise externalised costs of society and the environment need to change their outlook from growth to development that integrates economics, society and the environment, recognising that they are interconnected and support diverse life. Firms should take precautions in using resources that can have irreversible adverse effects on planetary life. The Gaia Theory addresses this in the next section. The organisational change outlook requires firms' stewardship of humankind and the environment (Barrett, 1996), which maximises welfare based on aggregated individual preferences (Beckerman, 1994) for this generation and future generations. The Theory of Distributive Justice addresses these issues in the next section.

### 3. Theoretical frameworks for sustainability reporting

The Brundtland Report definition points out that this generation and future generations are stakeholders. Using the broad definition of stakeholders as those who affect and are affected, humanity (this and future generations) and the earth are two broad stakeholder groups (Brundtland Commission, 1987). Isaksson and Steimle (2009) state when firms engage in financial value creation, that should lead to taking care of the two broader stakeholder groups – humans and the earth. Firms depend on resources offered by more than one capital type to create financial value. The activities firms undertake that affect them and are affected by them should have sustained justice to these two broad stakeholder groups. Figure 1 draws attention to the planet as a living system with Gaia Theory and having sustained justice with the Theory of Distributive Justice.

#### 3.1 Gaia theory

Gaia Theory posits four integrated spheres that regulate living conditions on earth: the biosphere, geosphere, hydrosphere and atmosphere (Lenton, 1998; Lovelock, 1979). In Gaia Theory, nature can be construed as these four systems. These four interdependent and integrated spheres create conditions and self-regulate so that life on earth (biosphere) can survive by adapting to situations (i.e. homeostasis). This happens through open system regulatory feedback mechanisms among the four spheres to allow planetary life to evolve



**Figure 1.**  
Theories for a  
framework of  
sustainability  
reporting

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(Cybernetics) (Lovelock, 1979). In Darwinism, the organisms' ability to compete, survive and reproduce leads nature towards biological evolution. In contrast, Gaia Theory points out that the four spheres interdependently self-regulate to continue life on earth through cosmic evolution (Lenton and Lovelock, 2000).

The open feedback mechanism among the four spheres contributes to planetary self-regulation by interacting with and inter-depending on each other, bringing life on earth able to evolve and continue (Billman, 2000). Solar energy has increased from 25% to 30% over the years in the atmosphere. However, the planetary conditions have continued to support life in the biosphere. Despite the atmospheric temperature increase, the ocean salinity level in the hydrosphere has been about 3.4% for a long time (Karnani and Annila, 2009). According to Gaia Theory, properties that sustain life are at the planetary (cosmic) scale. For instance, organisms such as a plant (biosphere) require access to carbon dioxide in the atmosphere for their survival. The plant also has a processing capacity to convert atmospheric material (carbon dioxide) into geological material (carbon).

The first law of thermodynamics explains that all matter stores energy available to do work (free energy) and is consumed when work is done. Using free energy released to the atmosphere increases atmospheric temperatures, creating chaos or disorder in the biosphere because such free energy is no longer available to be put to use in the biosphere (Wikipedia, 2021). Human activities also create heat energy, such as burning fossils that are carbon-rich and using non-renewable energy deposited on the planet. This burning releases more carbon dioxide, which traps heat energy in the atmosphere, not allowing it to return to space.

The second law of thermodynamics explains that when there are disorders in energy flows, chaotic situations can increase energy dissipated as wasted energy into the atmosphere (entropy). For instance, solar energy not absorbed by the earth (geosphere) is re-emitted as heat energy to the atmosphere. Some heat is essential to return daily to the atmosphere to cool up nights, but the nights become warmer when atmospheric temperatures are irreversibly increased. Consequently, the new disordered condition transforms the biosphere into a new form of the biosphere in the future. Such transformation is irreversible because the chaos settles into an irreversible new order of the biosphere (Karnani and Annila, 2009).

Disrupting natural flows is inevitable in human activity, just as chaos and new orders are essential for human progress, leading to new equilibriums on the earth (Rubin and Crucifix, 2022). However, sustainable development should ensure that new equilibriums support life in the habitable ranges. When non-renewal energy sources (such as coal, natural gas, petroleum, cement production and nuclear energy) of limited supply are used, they are irreversibly transformed and unrecoverable back as energy, increasing entropy. The increased entropy makes more heat flow from hot to cold regions, decreasing free energy, decreasing ice formation and, consequently, increasing volume and temperature, especially in the equatorial water (Deutscher, 2008). They give rise to stability that redefines habitable ranges in the geosphere and hydrosphere for the continued existence of diverse life (biosphere) with resources continually available to this generation and for future generations.

A way to preserve sustainable resources is to stop the depletion of non-renewable energy sources, reuse renewable energy sources and capture and store excessive atmospheric energy on the geosphere for later use (such as carbon capture). Human activity (such as forestation) that consciously decreases carbon dioxide and methane (i.e. greenhouse or heat-retaining gases) emissions into the atmosphere and captures free energy otherwise dissipated back into the atmosphere becomes an essential part of sustainable development

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(Karnani and Annala, 2009). Diverse life plays diverse roles (humans inhale oxygen and plants inhale carbon dioxide for photosynthesis) bringing about planetary interdependence.

### 3.2 Theory of distributive justice

There needs to be a set of principles to assign fundamental rights and duties and determine how to distribute the benefits and burdens to those who socially cooperate within the overall structure. The societal structure uses terms of cooperation based on justice, which can be construed in many ways, and fairness is one of them (Rawls, 1999). The Theory of Distributive Justice points out how society allocates scarce resources among individuals who compete to satisfy needs, wants and claims and where distributions should follow the principles of justice representing fairness. There are no agreed economic frameworks of social justice or social fairness because fairness as a way of distributing justice does not have a clear structure. Therefore, responding to distributive justice includes philosophical thinking because it still needs clarity of responses (Roemer, 1996).

One philosophical proposition of distributive justice is to provide a larger share of scarce resources to less privileged people as a legitimate entitlement rather than thinking that they are given as handouts to them (Marshall *et al.*, 1999). Individuals who receive resources because of their elite status do not fall within distributive justice. Another philosophical proposition is the concept of deserts (in the sense of deservingness) – a reward received based on contributions. The notion of desert has strong acceptance in market-driven societies. Applying this concept requires values and goals determined by external contexts – in the economic context, often it is the market (Lamont, 1994). Nevertheless, any justice distributed with fairness must be socially sustainable and must pass on to generations.

Scarcity of resources applies to society (e.g. people's capability), the environment (e.g. non-renewable reserves) and money (Dobson, 1998). Firms are social actors in that persons employed there can make human interventions and have the capacity and capability to uphold distributive justice leading to fairness. When narrowly focused on monetary value creation, firms can disregard their accountability towards distributive justice within the planetary system. They can also lose sight of taking care of interdependent resources in the planetary system and integrating them for the continuation of life on earth.

As shown in Figure 1, based on Gaia Theory, a sustainability reporting framework should make firms show that activities that contribute to new equilibriums maintaining life on earth within the habitable ranges have not decreased, have either been maintained or increased. The new equilibriums are set on earth by the interdependent four spheres to continue diverse life, where humans are a species. The two theoretical constructs of Gaia Theory adhere to the principles of diversity and interconnectedness of sustainable development (Throsby, 2017). Based on the Theory of Distributive Justice, the sustainability reporting framework should make firms demonstrate that they have fairly used social, environmental, non-financial and financial resources to establish homeostasis to continue diverse life on earth. The equity construct in the Theory of Distributive Justice adheres to the intragenerational and intergenerational equity principles of sustainable development (Throsby, 2017). The underlying sustainability reporting principles are interdependent planet, diverse life, intragenerational equity and intergenerational equity. Firms can practically demonstrate these practices by incorporating reporting with sustainability reporting outcomes.

An outcome- and impact-based sustainability reporting requires firms to demonstrate their contribution to sustaining diverse life on earth, showing fair use of scarce resources. The reporting goals are the 17 UN SDGs, which form the reporting framework. Gaia Theory supports these goals by understanding that the planet is an interdependent living system



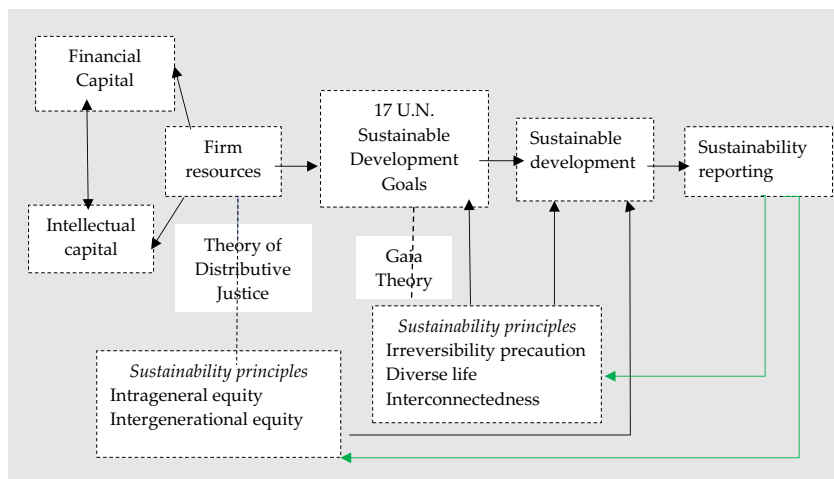
with diverse life, and some human actions can produce irreversible results. The Theory of Distributive Justice denotes that organisational activities underpin fairness towards attaining UN SDGs only by carefully and responsibly managing resources entrusted to them (Barrett, 1996; Mills-Scofield, 2011; Pucker, 2021). Sreedharan and Kapoor (2018) examined the garment export industry in Vietnam, the second-largest exporter next to China, and reported that the lack of stewardship in firms can lead to putting profits before fair use of resources. This can lead to labour rights violations, including forced labour and child labour.

Firms upholding stewardship and undertaking activities that support fairness to attain UN SDGs benefit from integrating thinking about the eight content elements described in the integrated reporting framework, namely, firm overview and external environment, governance, business model, risks and opportunities, strategy and resource allocation, performance, outlook and basis of presentation (GRI, 2021). The thinking undertaken is in a value chain context (raw materials, suppliers, inbound logistics, firm operations, distribution, product use and product end life) to contribute to sustainable development (SDG Compass, 2015).

#### 4. Towards an integrated sustainability reporting framework

Figure 2 shows a framework to integrate sustainability reporting with financial capital and intellectual capital. Adams (2017) pointed out that a conceptual framework aligned with UN SDGs can support firms in thinking integratively about their sustainability outcome contributions. Beyne *et al.* (2021) state that integrated thinking is about how firms can contribute to a broader agenda of firm value creation. UN SDGs provide a plan for firms to focus on sustainability and develop systems within firms. This theoretically founded framework shows the connectivity between theoretical concepts, sustainability principles, SDGs and sustainable development.

The term capital has acquired various meanings from its original version as the count of cattle. These now follow two streams of thought (Braun, 2017; Hodgson, 2014). The first stream is that capital covers all means of production – physical, not necessarily financial, as capital is about accumulating things. This meaning came about after Adam Smith's



**Figure 2.** Capitals and United Nations Sustainable Development Goals

interpretation of wealth, now embraced by economists and sociologists. The integrated reporting framework that uses six types of input capital (financial, manufactured, intellectual, human, social and relationship and natural) (Adams, 2017; Integrated Reporting Framework, 2021) appears to follow this stream of capital interpretation. The second stream holds that capital is the money value of all means of profit-making available to a firm. It is the money or realisable money value (of tangible and intangible assets) of owned and collateralisable property. This sustainability framework takes a financial accounting value proposition based on conceptual thinking undertaken by philosophers and researchers before Adam Smith. This framework uses the second stream of thought of capital as resources available to a firm and not considered as a production factor. Capital is the money invested in business assets. In a market economy, firms allocate these assets as resources to meet consumer demands. A case study by Murthy and Mourtisen (2008) with an Australian bank found that financial capital and intellectual capital are complementary, with financial capital having an effect and becoming a crucial input to developing intellectual capital. Khattak and Shah (2020) conducted a study with small- and medium-sized enterprises in Pakistan that examined the financial capital and intellectual capital impact on firm performance mediated by competitive advantage and found that both capitals positively and significantly influenced firm performance. These findings show that these two capitals require integrated thinking. Firms contributing to the 17 UN SDGs support sustainable development and increase the means of production to enhance social capital, environmental capital and intellectual capital representing the UN SDGs. The approach is consistent with the first stream of thought to classify those goals based on their aims, leading to intellectual capital, social capital and environmental capital. In sustainability reporting, firms report about them.

The firm's financial capital and intellectual capital resources enable a firm to engage in sustainable development by contributing to the 17 UN SDGs to uphold the precaution on irreversibility, interdependence and diversity and adhere to the sustainability principles supported by Gaia Theory. A firm can access these capital resources for sustainable development, but it requires fair use of them to maintain intragenerational equity and intergenerational equity sustainability principles, supported by the Theory of Distributive Justice. The five sustainability principles guide firms toward contributing to sustainable development. Firms report sustainable development using the 17 UN SDGs, as they are found relevant to their firms. In sustainability reporting, firms follow the five sustainability principles because they show their contribution toward UN SDGs using firm resources, activities, outputs and impacts. This article proposes a single corporate report where all information (statements and management commentaries) is independently audited.

#### *4.1 Section 1 of the corporate report: Financial reporting*

In corporate reporting, financial reporting takes centre stage. The objective of preparing general purpose financial reports is to provide information using four prepared statements: statement of income, statement of financial position, statement of cash flows and statement of changes in equity with an underlying assumption that the firm is a going concern. Financial reporting uses assets, liabilities, equity, income and expenses as reporting elements to capture events with probable and reliably measurable cash flow implications (IFRS, 2020). A management commentary in financial reporting aims to enhance primary report users – investors and creditors – to understand further information reported in a firm's financial statements. It also provides insight into factors that affect its ability to create financial value and to generate cash flows across all time horizons, including the long term (IFRS, 2022).

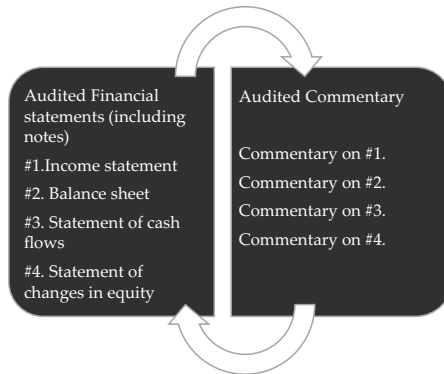
In the management commentary document available as an Exposure Draft, the International Financial Reporting Standards Board intends to replace management descriptions with two explicit disclosures. First, the management identifies information specific to the firm; second, external assurance assesses whether the information provided in the management commentary meets the needs of investors and creditors (IFRS, 2022).

Figure 3 shows the reporting arrangement. A typical financial report discusses monetary transactions and events. However, in integrated sustainability reporting, firms can show the effect of intellectual capital benefitting financial value creation. For example, brand advertising costs shown in the income statement can increase revenue from that product line and enhance the valuation of an internally generated brand. A sustainability-conscious firm can have an environmentally friendly (e.g. organic tea) or socially friendly product (e.g. child-labour-free coffee beans). These branded product lines can internalise otherwise externalised costs. Organic tea productions are likely to have lower harvesting yields. The coffee bean producers are likely to pay higher wages because they employ adult workers. However, by appealing to sustainability-conscious customers who are willing to pay a premium price for the products, firms can recoup the internalised costs. The firms should discuss the internalised costs of replacing child labour with adult labour and the impact of the loss of yield because of using organic fertiliser rather than chemical fertiliser in the management commentary of financial statements. However, there is an appreciation of the brand value of these products that can be discussed under intellectual capital. In those discussions, firms can point out how these endeavours have led to attaining UN SDGs (8. Decent work and economic growth and 15. Life on land).

Figure 3 illustrates financial capital reporting included in the corporate report as the first reporting section that contains the four audited financial statements, including the notes accompanying them. The audited management commentary follows the financial statements that illustrate and support financial reporting. The management commentary can explain how these resources contributed to the itemised SDGs.

4.2 Section 2 of the corporate report: Intellectual capital reporting

The second section of corporate reporting is the economic aspect of intellectual capital reporting to show the firm’s support of financial value creation (Guthrie and Petty, 2000). A firm can contain an intellectual capital statement and/or management commentary to support it. The intellectual capital reporting section can be arranged under sub-headings of internal capital, external capital, human capital and the management commentary.



**Figure 3.**  
An illustration of reporting arrangement in the financial reporting section

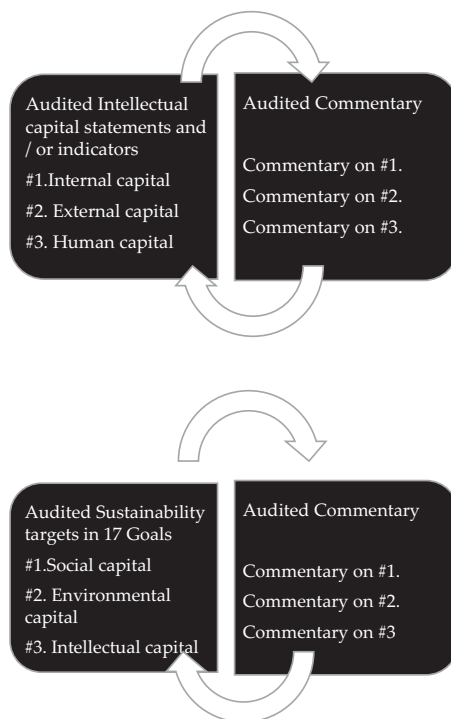
Figure 4 shows the reporting arrangement of economic aspects of intellectual capital. In their Australian study, Guthrie and Petty (2000) identified nine internal capital items: patents, copyrights, trademarks, management philosophy, corporate culture, management processes, information systems, networking systems and financial relations. They identified nine external capital items: brands, customers, customer loyalty, company names, distribution channels, business collaborations, licensing agreements, favourable contracts and franchising agreements. There were six human capital items: knowhow, education, vocational qualification, work-related knowledge, work-related competencies and entrepreneurial spirit (innovativeness, proactive and reactive abilities and changeability).

Figure 4 shows the audited intellectual capital statements and/or indicators. It is the second section of the corporate report. The three sub-headings guide the reporting: internal, external and internal capital; firms identify the intellectual capital relevant for reporting. The intellectual capital statement and/or indicators accompany a management commentary. The management commentary can explain how financial resources as inputs contributed to the itemised SDGs.

#### 4.3 Section 3 of the corporate report: Sustainability reporting

The third aspect of corporate reporting is sustainability reporting. Unlike the other two input- and output-based sections, this section follows outcome-based reporting. The outcomes of social capital, environmental capital and intellectual capital representing UN SDGs are reported here.

Figure 5 shows the arrangement of the sustainability reporting section. The UN's Sustainable Development Framework identifies 17 UN SDGs in the following areas: No



**Figure 4.**  
An illustration of  
reporting  
arrangement in the  
intellectual capital  
reporting section

**Figure 5.**  
An illustration of  
reporting  
arrangement in the  
sustainability  
reporting section

poverty; Zero hunger; Good health and well-being; Quality education; Gender equality; Clean water and sanitation; Affordable and clean energy; Decent work and economic growth; Industry, innovation and infrastructure; Reduced inequalities; Sustainable cities and communities; Responsible production and consumption; Climate action; Life below water; Life on land; Peace, justice and strong institutions; and Partnership for the goals (Abeyseker, 2022; United Nations, 2015). The UN’s sustainable development pathways indicate that achieving these goals (outcomes) requires resorting to multiple resources.

Figure 5 shows the third section of the corporate report – sustainability reporting. In the audited SDGs, the information comprises social capital, environmental capital and intellectual capital, depending on which the firm reports SDGs. Under each capital category are the itemised SDGs. The accompanying commentary includes reference to the financial and intellectual capital resource input. The sustainability reporting commentary illustrates the activities undertaken; output results from the activities, outcomes and impacts achieved because of the outputs. In reporting about the input of resources, the firm can show how it harnessed financial resources reported in the first section and intellectual capital resources in the section of the corporate report as input resources. That way, the three reporting sections are interconnected in corporate reporting towards sustainability reporting. A reporting illustration is provided in the Final Remarks section.

Figure 6 shows sustainability outcomes classified under capital categories. As UN SDGs provide a policy framework for reporting, firms can use each goal defined as a sustainability outcome. Abeyseker (2022) classified the UN SDGs as falling within three categories: I. intellectual capital, II. environmental capital and III. social capital. There are four goals related to intellectual capital: Goal 9 – Industry, innovation and infrastructure; Goal 11 – Sustainable cities and communities; Goal 12 – Responsible consumption and production; and Goal 17 – Partnership for the goals. There are five goals related to environmental capital: Goal 6 – Clean water and sanitation; Goal 7 – Affordable and clean energy; Goal 13 – Climate action; Goal 14 – Life below water; and Goal 15 – Life on land. There are eight goals related to social capital: Goal 1 – No poverty; Goal 2 – Zero hunger; Goal 3 – Good health and well-being; Goal 4 – Quality education; Goal 5 – Gender equality; Goal 8 – Decent work and economic growth; Goal 10 – Reduced inequalities; and Goal 16 – Peace, justice and strong institutions.

The targets (indices) set within the UN SDGs become the benchmark for organisational reporting (United Nations, 2021). For instance, Goal 1 (No poverty) sets seven targets to attain global sustainability by 2030:

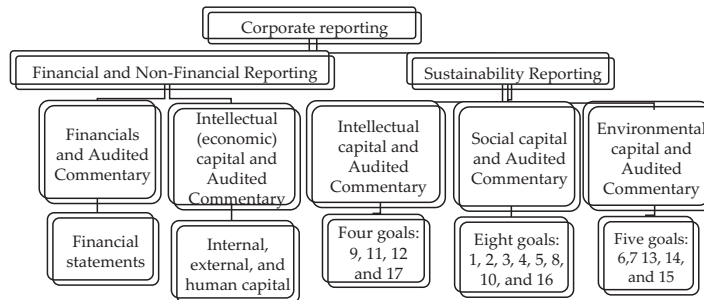


Figure 6.  
Corporate reporting  
framework

- (1) eradicate extreme poverty, measured as people living on less than \$1.25 a day;
- (2) reduce poverty by half for all living age groups, with poverty identified according to national definitions;
- (3) implement social protection systems that substantially cover the poor and vulnerable;
- (4) ensure that all, especially the economically disadvantaged and otherwise vulnerable, have equal rights to resources, access to services, ownership and control of resources and finance;
- (5) build resilience among less privileged populations and those vulnerable to adverse consequences from climate and other environmental shocks;
- (6) mobilise resources to developing countries to end poverty in all dimensions; and
- (7) create national, regional and international policy frameworks and use gender-sensitive strategies to eradicate poverty.

Firms then use the UN sustainability targets to report about resource use, activities that were undertaken, outputs generated from activities, outcomes as changes that occurred because of the outputs and impacts as specific changes (SDG Compass, 2015).

There are three aspects to consider when operationalising the proposed sustainability reporting. First, firms should avoid reporting cluttered information by only reporting information that matters, which is of significance. Materiality is a construct arising from three interactions – firm, auditor and ethics (David and Abeyssekera, 2011). This paper provides a revised version of the materiality description in the SDG Compass (2015, p. 27) as “issues that reflect firm’s significant outcomes and impacts on UN SDGs that substantively influence the assessments and decisions of stakeholders”. Firms can avoid reporting clutter by selecting and consistently following the benchmarked targets relevant to the 17 UN SDGs and by reporting the outcomes of these goals under the three capital categories – intellectual capital, social capital and environmental capital. Target-led reporting meets the compliance aspect of sustainability reporting. A key element of sustainability reporting is demonstrating the firm’s performance discussed in financial reporting and intellectual capital reporting that has contributed to the overall outcomes and impacts of sustaining diverse life on earth with fair use of resources, captured in sustainability reporting. Firms can show ways their activities support the five underlying principles of sustainable development: interdependence of planetary system, preserving diverse life, engaging in precautionary actions taking note of irreversibility espoused by Gaia Theory and upholding intragenerational equity and intergenerational equity espoused by the Theory of Distributive Justice.

Firms can benefit from the logic model presented by the SDG Compass (2015, p. 14) in sustainability reporting. Firms can make commentaries as inputs (resources used affecting the UN SDGs) as follows. They are activities (actions taken), outputs (what those activities have generated because of the output?), outcomes (what difference has the output made to sustainability principles?) and impacts (what are those specific changes contributed to the sustainability principles?). There is more than one target to aim at a UN SDG. The UN SDGs targets chosen by a firm can serve as themes or storylines that a firm aims at in sustainability reporting as contributing toward a chosen SDG. The 17 SDGs accompany 169 targets (Smith, 2020). There are 231 unique indicators with a total of 248 indicators, with 13 indicators repeating under two or more targets (United Nations Sustainable Development Goals, 2022). The indicators relevant to firm activities undertaken and outputs achieved can assist to assess the outcomes and impacts (SDG Compass, 2015).

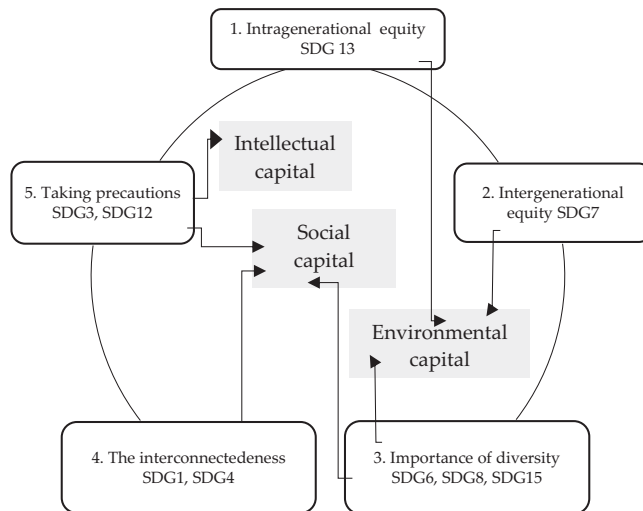
The following briefly provides an example of how a firm engaged in the mining industry, mining natural resources in developing countries and engaging in sustainability reporting might present a report under the five sustainability principles (United Nations, 2022). The firm uses the sustainability principle to demonstrate contribution to UN SDGs. These UN SDGs enhance three aspects of sustainable development capital: social, environmental and intellectual (Figures 1 and 6). A chosen SDG can associate with one or more sustainability principles in a firm. The chosen SDG contributes to social capital, environmental capital or intellectual capital towards sustainable development (Figure 6). The five sustainability principles variously contribute to social capital, environmental capital and intellectual capital towards sustainable development. Figure 7 shows that the sustainability reporting follows the five sustainability principles.

*4.3.1 About our firm.* We are in the business of harnessing natural resources. Our vision is to support a better world with energy and technological development, where future generations have a brighter future. Our firm enjoys mining industry membership and conducts business operations in the African continent. Diverse and experienced board members represent societal cultures, age ranges and qualifications and lead our strategic thinking and direction. We take pride in having a majority of female directors and independent directors. We follow an adaptive business model, which is revisited every three years in the context of risks and opportunities, strategies for resource allocation, business performance and future outlook. We understand that value creation through an adaptive business model in a fast-changing world requires collective partnerships of all stakeholders in our value chain who partner with us in revising our business model. We are a member of the World Business Council for Sustainable Development.

*4.3.2 Section 3: Sustainability report and commentary.*

- (1) Intragenerational equity.

We have contributed to intragenerational equity by enhancing environmental capital through UN SDG 13 Climate Action.



**Figure 7.**  
Sustainability reporting in the conceptual firm

- *Inputs:* We invested \$10m in low emission technologies to positively affect the UN SDG 13.2 to integrate climate-related strategies into our activities. Financial capital reporting commentary provides further details about our investment.
- *Activities:* To support our strategy of reducing greenhouse gas emissions, we hired two full-time research scientists with doctoral qualifications. We also obtained routine expert advice from a climate change expert panel about lowering greenhouse gas emissions in our value chain.
- *Outputs:* These activities have strengthened resilience and adaptive capacity to climate-related hazards and natural disasters across countries. The effects of greenhouse gas emissions cut across jurisdictional boundaries.
- *Outcome:* We revised our supplier selection criteria to meet lowering gas emissions in the value chain. These conform to UN SDG 13.2.1 which fosters climate resilience and low greenhouse gas emissions.
- *Impacts:* Measuring the outcome contribution using UN SDG 13.2.1; with our past and current actions, we have now lowered total operational emissions by 10 % in this reporting year, compared with the previous third reporting year.

(2) Intergenerational equity.

We have contributed to intergenerational equity by enhancing environmental capital through the UN SDG 7 Affordable and Clean Energy.

- *Inputs:* We have signed a 30-year agreement with a solar farm in the African continent to obtain solar energy. This agreement can increasingly mitigate the use of non-renewable energy in decades to come having a positive effect on UN SDG 7.2 to increase the share of renewable energy. Intellectual capital reporting commentary provides further details about our rights relating to the agreement.
- *Activities:* Our agreement with the solar farm company is such that we invest \$5m each year as a convertible loan. We have an option of converting them into equity four years after each investment so that we can share ownership of the solar farm with the current owners.
- *Output:* The agreement has enabled us to decrease the reliance on non-renewable energy in the reporting period by 5% and expect to continue as such in every future year.
- *Outcomes:* Our investment in the solar farm in the remote region creates cheap solar energy for us and 2,000 rural houses in the area over the project period supporting UN SDG 7.2.1 of renewable energy share in the community.
- *Impacts:* In this reporting year, we have already achieved a 5% reduction in non-renewable energy use and replaced it with solar energy. Further, the project has provided solar energy connections to 100 rural households supporting UN SDG 7.2.1.

(3) Importance of diversity.

We acknowledge that biodiversity favours the health and well-being of people, animals and plants. Hence, we have contributed to the importance of diversity by enhancing environmental capital through the UN SDG 6 Clean Water and Sanitation and UN SDG



15 Life on Land. We also contributed to increasing social capital through UN SDG 8 Promotes inclusive and sustainable economic growth, employment and decent work for all.

- *Inputs:* Mining activities that we undertake can lead to significant adverse environmental impacts primarily caused by acid and metalliferous drainage, resulting in pollution of the nearby river. Mining can lead to deteriorating soil quality and fertility and increasing toxicity, leading to habitat loss. Our estimate of rehabilitation is 10% of the total net profits from the project, supporting UN SDG 6.3 to improve water quality by reducing pollution. In this reporting year, the firm purchased 1,000-hectare bare land 5 km from the mining site. We commenced planting diversely suited plants to improve the ecological environment supporting UN SDG 15.1 to conserve and restore terrestrial and freshwater ecosystems. The project also led to employment generation in the local community by supporting UN SDG 8.5, which generates decent work with equal pay. The financial capital reporting commentary provides more details about the investment in the forestation project. The intellectual capital reporting commentary provides details of the enhancement of corporate image because of this investment.
- *Activities:* Our firm has already drawn up a 15-year rehabilitation plan in the final stages of agreeing with the stakeholders, including the community group, local government and state government. We have completed planting 200 hectares of land with seedlings fertilised with organic fertiliser. The project required sourcing paid labour from the local community.
- *Outputs:* We have created a reserve account on our balance sheet to set aside net operating profits so that they are not available for dividend distribution and capital reinvestment. Financial capital reporting commentary provides further details about this special capital reserve. Of the seedlings, 90% have taken roots and thrived and have replaced the 10% of seedlings that could not succeed.
- *Outcomes:* We test the ground and river water samples through independent parties for safe drinking water for humans and animals, contributing to a higher proportion of bodies of water with good ambient water quality supporting UN SDG 6.3.2. The forest plantation that our firm has commenced is the first and only in the local council area supporting UN SDG 15.1.2. The project leads to employing six full-time staff; three males and three females, with equal pay supporting UN SDG 8.5.1.
- *Impacts:* Our tests have confirmed that all watersheds are appropriately taken care of and treated. The annual informal survey conducted to obtain community sentiments showed that the forestation project had increased the firm acceptance level among the community by 10% from the previous reporting period.

(4) Interconnectedness.

We have contributed to interconnectedness by enhancing environmental capital through UN SDG 1 Poverty Alleviation and UN SDG 4 Quality Education.

- *Inputs:* Our mining operations in remote regions in a developing country setting means we have a social responsibility to take care of the community and

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environment, while we benefit from conducting economic activities there. We have already begun building a primary school in that region and invested \$2m in building and infrastructure (UN SDG 4.1). We have also included a “community first employment policy” where we offer jobs to community members (UN SDG 1.2). The financial capital reporting commentary provides further details about investment in building and infrastructure, and the intellectual capital reporting commentary offers more information about the training and skill-building of our future workforce.

- *Activities:* We are working with the local government to recruit teaching staff and have agreed to pay additional allowances to attract and retain teachers within the community. We now offer jobs to community members first and, if required, offer training to attract them.
- *Outputs:* Our teacher attraction and retention policy attracted five teachers as primary school teachers. We have also identified 20 community members to undergo employment training.
- *Outcomes:* Two teachers have accepted the employment and commenced work in the reporting year. The initiative enables the rural community children to obtain a decent primary education (UN SDG 4.1.1). Five community members have accepted the training and commenced probationary employment in the reporting year (UN SDG 1.2.2).
- *Impacts:* An interview survey conducted with the community has shown that their trustworthiness and acceptance of our company now stands at four out of five on a Likert Scale survey.

(5) Precautions taken against human actions can lead to irreversible results.

We have contributed to interconnectedness by enhancing environmental capital through UN SDG 3 Good health and well-being and UN SDG 12 Responsible consumption and protection.

- *Inputs:* Working in the mining industry can potentially adversely affect mental and physical well-being. We have invested in mental health counselling at the mining site and ensured that workers are trained and updated on occupational health and safety consistent with UN SDG 3.5 to prevent harmful use of alcohol to uplift good health and well-being. The public entertainment bar has a strict alcohol consumption policy where raw materials brewed obtained from organically certified farms are consistent with UN SDG 12.1 natural resources with a material footprint. The intellectual capital reporting commentary provides additional details about steps taken to boost the productivity of our workforce.
- *Activities:* To support our staff, we have employed a full-time nurse with qualifications in mental health, first aid and emergency treatment. We also fly in a medical doctor monthly for staff to consult on a bulk billed basis. We employ restaurant staff at the mining site who have undergone training and are certified in responsible alcohol consumption.
- *Outputs:* Our occupational health and safety training programs show that 95% of staff are fully conversant in responding to emergency actions. Of the staff, 80% identified early symptoms of mental imbalances and disorders. We also run biannual training in responsible alcohol consumption which is compulsory training that staff must undergo before accepting employment.

- *Outcomes:* The number of staff seeking help from the resident nurse and visiting doctors to prevent themselves from alcohol abuse increased by 10% in the reporting year compared to the previous year (UN SDG 3.5.2). We increased the proportion of beer bottles obtained from organically certified breweries (UN SDG 12.2.1).
- *Impacts:* The increase in staff visits showed that they were more interested in discussing preventive rather than curative measures. The staff visits for preventive measures increased by 20%, while staff visits for corrective actions decreased by 60%. Staff who discussed harmful effects of alcohol consumption as precautionary measures increased from 10% during previous reporting period to 15% during this reporting period. The staff choosing organically certified beer for consumption increased by 20% in the firm's public entertainment bar during this reporting period.

## 5. Final remarks

A corporate report integrating sustainability can undermine the focus on important information (FRC, 2010). The corporate report can have three sections to help users focus on and obtain relevant information: I. Financial reporting, II. Intellectual capital reporting and III. Sustainability reporting. The first two sections report inputs (such as costs incurred) and outputs (such as revenue increases and asset value appreciations) of firm's activities towards SDGs. The sustainability reporting section reports on sustainability outcomes and impacts attained from financial and intellectual capital input and outputs. The sustainability reporting framework differs from the previously proposed aligning of the UN SDGs in the integrated reporting framework (Adams, 2017). In this framework, financial and intellectual capital (economic) is the input capital that enables meeting the 17 UN SDGs outcomes and reporting about them. This framework identifies these SDGs under social, environmental and intellectual capital. Additionally, this framework promotes sustainability outcome and impact reporting rather than sustainability performance reporting. It also does not aim to report inter-firm comparison because firms meet outcomes as they best meet their chosen SDGs. No agreed consistent measurement techniques lead to meaningful inter-firm comparisons (Cardoni *et al.*, 2019; Pucker, 2021).

### 5.1 Research implications/limitations

This conceptual paper has provided two theoretical constructs from Gaia Theory and two theoretical constructs from the Theory of Distributive Justice. They follow the five principles of sustainable development. The two theories follow a holistic approach aligning with the holistic approach towards sustainability proposed by the 17 UN SDGs. Future research can empirically test firms' engagement with sustainability outcomes on the five sustainable development principles – intergenerational equity, intragenerational equity, the importance of diversity, interconnectedness and taking precautions against human actions that can lead to irreversible results on sustainability. A key aspect of this paper is to encourage firms to report on sustainability outcomes and impacts. Future research can examine firms' engagement with sustainability outcomes and identify which of the 17 UN SDGs are most reported as outcomes. Another aspect of the paper is internalising costs. Research can examine the firm profiles that engage in internalising costs.

### 5.2 Practical implications

The article proposes that corporate reporting contains three sections: financial reporting, non-financial (economic intellectual capital) reporting and outcome- and impact-based sustainability reporting in a single report. The reporting framework uses the targets set by the UN SDGs that a firm can aim at making a contribution toward sustainable development. The corresponding indicators of targets assist firms to assess the outcomes and impacts made through their contribution. The purpose of sustainability reporting is not about intra- and inter-firm comparison but about the measured, independently audited contribution they have made towards sustainable development. The contemporary emphasis on sustainability standard-setters for firms to report to produce consistent and comparable information encourages firms to report on outputs. However, research has documented that firms report different information on standard-setters reporting matrices, so this kind of reporting does not lead to comparative information (Grainger-Brown and Malekpour, 2019).

### 5.3 Social implications

Short-term solid financial performance is an inevitable goal of market economics. Sound financials are a key for firms to continue their operations. However, two things are required to ensure reporting of sound financials: accounting standards must undergo continuous improvement, and there must be mechanisms to identify and deter the manipulation of financial numbers that could inhibit accurate financial reporting. The short-term focus on financial performance in corporate reporting now often contains financial reporting, intellectual capital reporting and sustainability reporting which is an observable favourable trend in reporting practice. When firms become morally conscious but hurt their profits, firms must communicate this to stakeholders so that morally aware stakeholders can favourably respond to it. For instance, fair-minded consumers can agree to a fair share of carbon dioxide tax on petrol and diesel, but those with high self-interest may not (Hammar and Jagers, 2007). Sustainability reporting is a two-way street. Both firms and stakeholders must meet with a moral consciousness.

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