Journal of Environmental Management 164 (2015) 180–195

Contents lists available at ScienceDirect

Journal of Environmental Management

journal homepage: www.elsevier.com/locate/jenvman

Review

A review of corporate sustainability reporting tools (SRTs)

Renard Y.J. Siew*

School of Civil and Environmental Engineering, The University of New South Wales, Sydney, 2052, Australia

ARTICLE INFO

Article history:
Received 27 April 2015
Received in revised form
16 August 2015
Accepted 6 September 2015
Available online xxx

Keywords:
ESG
Corporate social responsibility
Sustainability reporting tools (SRTs)
Frameworks
Standards
Ratings
Indices
Literature review

ABSTRACT

Sustainability reporting has been increasingly adopted by corporations worldwide given the demand of stakeholders for greater transparency on both environmental and social issues. The popularity of such reporting is evidenced by the development of a range of tools in the last two decades – Global Reporting Initiative (GRI), AA1000 and Carbon Disclosure Project (CDP) inter alia. These tools, referred to collectively as corporate sustainability reporting tools (SRTs) are important as they serve to inform the progress of corporations towards achieving sustainability goals. However, the rapid growth of corporate SRTs, with different criteria and methodology has created major complications for stakeholders. This paper makes a genuine contribution by providing a review of some of these major tools, spanning across a wide spectrum - framework, standards, ratings and indices. A critique of SRTs is also given. Institutional investors, governments, practitioners and individuals may find this review useful in terms of understanding the nature of different corporate SRTs. As well, it can serve as a useful reference for the development of the next generation of corporate SRTs.

Contents

* Corresponding author.
E-mail address: rensiew10@gmail.com.

http://dx.doi.org/10.1016/j.jenvman.2015.09.010
0301-4797/

1. Introduction

In the last two decades, the concept of sustainability has gained prominence across the globe. While understanding of sustainability varies, the most commonly accepted definition comes from the Brundtland Report (1987) which states that 'Sustainable development is development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs'. This definition, however, is not critic-proof. Bartlett (1998), Wallner (1999) and Székely and Knirsch (2005) maintain that the definition given in the Brundtland Report (1987) is vague and 'un-operationalizable'. The Brundtland Report itself has been criticised for its primacy on economic growth in order to achieve sustainable development (Robinson, 2004).

There have been various attempts to provide a more precise meaning of sustainability in the business context. One representative definition is given by IISD (1992), 'adopting business strategies and activities that meet the needs of the enterprise and its stakeholders today while protecting, sustaining and enhancing the human and natural resources that will be needed in the future'. Székely and Knirsch (2005) define sustainability for corporations as 'sustaining and expanding economic growth, shareholder value, prestige, corporate reputation, customer relationships, and the quality of products and services. It also means adopting and pursuing ethical business practices, creating sustainable jobs, building value for all corporation's stakeholders and attending to the needs of the underserved'. van Marrewijk (2003) offers the following definition: 'demonstrating the inclusion of social and environmental concerns in business operations and interactions with stakeholders'.

Despite the multiplicity of definitions, there is a common understanding that to gauge how a corporation is doing with respect to sustainability, it should be measurable (Özdemir et al., 2011). Stakeholders are increasingly demanding for more disclosures not just on economic performance but also a corporation's environmental and social practices (Waddock, 2003). This has been the key motivator for the development of corporate sustainability reporting tools (SRTs), which like sustainability is also known with various terminology – corporate social responsibility (CSR) reporting, sustainable development (SD) reporting, triple bottom line (TBL) reporting, non-financial reporting, and environmental, social and governance (ESG) reporting. The historical background of such reporting is interesting. Marlin and Marlin (2003) suggest that the first phase of CSR reporting is between the 1970s and 1980s where the focus is merely on the reporting of a corporation's compliance to environmental management. There is no real linkage to corporate performance. Then, in the 1990s, a paradigm shift to reporting on occupational health and safety (OHS) or community based activities is observed, followed closely by the institutionalisation of the triple bottom line concept. The triple bottom line emphasises on capturing a wide spectrum of values and measures a corporation's performance across the three main pillars of sustainability; economy, social and the environment.

SRTs in general make it possible to demonstrate results by measuring progress and clarify consistency between activities, outputs, outcomes and goals. Naturally, they are also recognised as an important tool to aid decision making and for comparative performance across corporations in different areas (Singh et al., 2009; Kessler, 1998). While it may be argued that different corporate SRTs are required to cater for the different nature of businesses, climates, culture and resources, the rapid growth in SRTs have made understanding them a very complicated exercise. Hence, this paper aims to make a genuine contribution by providing a review of corporate SRTs.

This paper does not serve to replace but rather complement existing reviews in this area. Adams and Narayanan (2007) focus primarily on bodies that promote sustainability reporting guidelines. Escrig-Olmedo et al. (2010) provide a review of ESG ratings and agencies. This paper departs from other reviews by providing a more holistic approach encompassing three mainstreams of SRTs (frameworks, standards, ratings and indices). Other main SRTs that have been ignored in the afore-mentioned papers are also included here.

The structure of the paper is as follows. The subsequent sections explore, respectively, the wide spectrum of corporate SRTs – frameworks; standards; ratings and indices. A critique of these tools and suggestions for future research then follow.

This paper will be of interest to a range of stakeholders – institutional investors, governments, corporations and individuals who seek to understand more about the nature of corporate SRTs. As well, this paper will serve as a useful reference for the development of the next generation of corporate SRTs.

2. Corporate SRTs

Corporate SRTs can be divided into a few categories: frameworks; standards; ratings and indices shown in Fig. 1. Frameworks typically refer to principles, initiatives or guidelines provided to

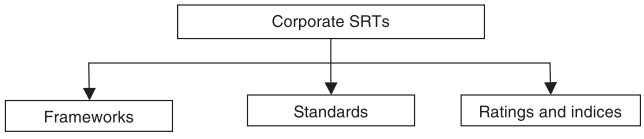

Fig. 1. Corporate SRTs.

corporations to assist them in their disclosure efforts. Standards have similar function as frameworks but exist in the form of more formal documentation that spell out the requirements, specifications or characteristics that can be used to ensure that sustainability efforts are consistently achieved. Ratings and indices are third party evaluation of a corporation's sustainability or ESG performance. The major tools in each of these categories are reviewed here for the reader.

2.1. Frameworks

This section provides an overview of existing frameworks for corporate sustainability reporting together with their relevant requirements.

2.1.1. Global Reporting Initiative (GRI)

The GRI was founded in 1997 by the Coalition for Environmentally Responsible Economies (CERES) with the intention of creating a globally applicable sustainability reporting framework (GRI, 2011). Since then, two subsequent versions of the third generation GRI guidelines have been issued namely G3 and G3.1 (an updated version of G3). A multi-stakeholder consultation approach is used to create the G3.1 guidelines with a stronger emphasis on clarity, purpose of criteria as well as the process of reporting. Sector supplements which are guidelines specifically for different industry sectors are provided. More recently, a fourth generation guideline (G4) has been developed. G4 includes proposed changes to themes such as Anti-Corruption and Greenhouse Gas (GHG) Emissions. These guidelines are not legally binding and are voluntary in nature (Adams and Narayanan, 2007).

According to the GRI guidelines, a typical report should address the following areas: vision and strategy; corporation profile; governance structure and management systems; GRI content index; performance criteria (economic, social and environmental) (Adams and Narayanan, 2007). Performance criteria are divided into either 'core' or 'additional'. 'Core' criteria are intended to identify generally applicable criteria and are assumed to be material to most corporations whereas 'additional' criteria refer to emerging practices that may or may not be applicable to all corporations. Materiality is defined in GRI guidelines as criteria that reflect the corporation's 'significant economic, environmental, and social impacts or that would substantively influence the assessments and decisions of stakeholders' (GRI, 2011). The three application levels namely A, B and C depending on a corporation's extent of disclosures and whether the report produced has received third party verification in which case it will be given a '+' has been removed in the G4 guidelines.

Chester and Woofter (2005) claim that the number of corporations using GRI's guidelines has been increasing exponentially and attributed this to several reasons:

- Demand for social and environmental information. Chester and Woofter (2005) point out that corporation adopting GRI guidelines may be able to significantly reduce the time and effort spent responding to disclosures on social and environmental information. Nikolaeva and Bicho (2011) find that competitive and media pressures together with their CSR media visibility are important determinants for the adoption of GRI. By publishing publicly-available GRI reports, companies do not need to spend too much time responding to individual requests from stakeholders (i.e. institutional investors or NGOs) on non-financial information.
- GRI-based reports are superior. Several studies have shown that GRI users score higher than non-users in a benchmark of overall quality of sustainability reports (Chester and Woofter, 2005, p. 19).
- More superior financial performance. GRI users have on average lower share price volatility and better operating profit margins (Chester and Woofter, 2005, p.19; Finch, 2005; Siew, 2014). This could possibly be driven by lower cost of equity and more accurate analysts' forecast as a direct result of more transparency. In an empirical study consisting of Australian companies, Siew et al. (2013) show that these companies that issue non-financial reports largely outperform those which do not in a number of financial ratios.

2.1.2. SIGMA project

The SIGMA Project describes a four-phase cycle (leadership and vision; planning; delivery; monitor, review and report) broken down into three to five levels each to manage and embed sustainability within a corporation. These phases and their purposes

Table 1
Sigma four-phase management framework (SIGMA Project, 2008).

Management phases	Purposes
Leadership and Vision	• Develop a business case to address sustainability and secure top-level commitment to integrate sustainability into core processes.
LV1: Business case and top-level commitment	• Identify stakeholders and open dialogue with them on key impacts.
LV2: Vision, mission and operating principles	• Formulate corporation's long term strategy.
LV3: Communication and training	• Raise awareness of sustainability.
LV4: Culture Change	• Ensure corporate culture is supportive of move towards sustainability.
Planning	• To ascertain corporation's current sustainability performance, legal documents and voluntary commitments.
P1: Performance review	• Identify and prioritise corporation's key areas of sustainability.
P2: Legal and regulatory analysis and management	• Develop strategic plans to deliver corporation's vision.
P3: Actions, impacts and outcomes	• Engage with stakeholders on plan.
P4: Strategic Planning	• Formulate tactical short term plans to support sustainability objectives.
P5: Tactical planning	• Align and prioritise management programs in line with corporation's sustainability vision.
Delivery	• Ensure appropriate internal controls are in place.
D1: Change Management	• Improve performance by delivering sustainability strategies and action plans.
D2: Management Programmes	• Exercise appropriate external influence on suppliers, peers and others to advance sustainable development.
D3: Internal controls and external influences	• Monitor progress against stated values, strategies and performance objectives.
Monitor, Review and Report	• Engage with internal and external stakeholders via reporting and assurance.
MMR1: Monitoring, measurement, auditing and feedback	
MRR2: Tactical and strategic Review	
MRR3: Reporting progress	
MRR4: Assurance of reporting	

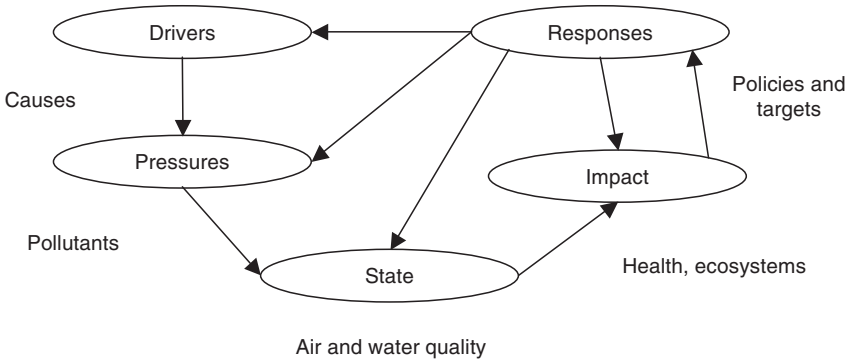

Fig. 2. DPSIR framework (Kristensen, 2004).

are shown in Table 1 (SIGMA Project, 2008, p.6).

2.1.3. DPSIR framework

Kristensen (2004) defines the DPSIR framework as a chain of causal links beginning with a set of driving forces (i.e. economic sectors, human activities) which translates into pressures (i.e. waste, emissions) to states (i.e. physical, chemical and biological) and impacts (i.e. ecosystems, human health, functions) eventually leading up to political responses (i.e. prioritisation, target setting and criteria) (Kristensen, 2004). This framework is an extension of Anthony Friend's pressure-state-response model (see OECD, 2003) in the 1970's and was subsequently adopted by the Organisation for Economic Cooperation and Development (OECD) (UNEP, 2006). It is currently used as an integrated approach for reporting by the European Environment Agency (EEA). Fig. 2 illustrates the relationships between the causal links. The driving force is defined as a need, for example, the driving force for an individual would be to seek shelter, food and water. Driving forces motivates human activities such as transportation or food production which exerts pressures on the environment such as direct emissions, production of waste and noise. As a direct consequence of these pressures, the state of the environment is affected, this could be either physical, chemical or biological conditions (air quality, water quality or soil quality among others). Changes in these states impact the quality of the ecosystems. As a result of these impacts, a response from either society or policy makers have the potential to influence any part of the DPSIR chain (Kristensen, 2004).

2.1.4. The Global Compact

The United Nation's (UN) Global Compact promotes ten principles across areas such as human rights, labour, environment and anti-corruption. It seeks the co-operation of corporations to embrace and support these principles within their sphere of influence. These principles are (UNGC, 2011):

Human rights:

- Principle 1: Corporations should support and respect the protection of internationally-acclaimed human rights.
- Principle 2: Make sure that they are not complicit in human rights abuses.

Labour:

- Principle 3: Corporations should uphold the freedom of association and the effective recognition of rights to collective bargaining.
- Principle 4: The elimination of all forms of forced and compulsory labour.
- Principle 5: The effective abolition of child labour.
- Principle 6: The elimination of discrimination in respect of employment and occupation.

Environment:

- Principle 7: Corporations should support a precautionary approach to environmental challenges.
- Principle 8: Undertake initiatives to promote greater environmental responsibility.
- Principle 9: Encourage development and diffusion of environmentally friendly technologies.

Anti-Corruption:

- Principle 10: Corporations should work together against corruption in all its forms, including extortion and bribery.

2.1.5. Carbon Disclosure Project (CDP)

The CDP is an independent non-profit corporation which holds one of the largest database on disclosure of greenhouse gas emissions, water use and climate change strategies on a global scale. The carbon disclosure scores assess corporations solely based on the quality and completeness of their disclosures (CDP claims that these scores are not an indicative measure of corporate performance because it does not make any judgment of a corporation's action to mitigate climate change) (CDP, 2010). Factors considered include corporation-specific risks and potential opportunities arising from climate change and good internal data management practices to help the corporation understand their GHG emissions. The carbon disclosure scores are normalised to a 100 point scale (CDP, 2010) each with its own indicative meaning described in Table 2.

2.1.6. World Business Council for Sustainable Development (WBCSD)

The World Business Council for Sustainable Development (WBCSD) consists of the world's leading corporations across a wide range of industry sectors. WBCSD offers a range of tools to support the embedment of sustainability into corporate strategy and operations such as the GHG Protocol, Sustainable Forest Finance Toolkit and the WBCSD Measuring Impact Framework to name a few. Of particular significance is the WBCSD Measuring Impact Framework which started in 2006 as a result of WBCSD member

Table 2
Scoring framework for CDP (CDP, 2010).

High (>70)	Mid-range (50–70)	Low (<50)
A high score typically indicates one or more of the following: • Strong understanding and management of corporation specific exposure to climate related risks and opportunities. • Strategic focus and commitment to understanding criteria related to climate change, emanating from the top of the corporation. • Ability to measure and manage the corporation's carbon footprint. • Regular and relevant disclosure to key corporate stakeholders.	A mid-range score typically indicates one or more of the following: • Growing maturity in understanding and managing corporation-specific risks and potential opportunities related to climate change. • Good evidence of ability to measure and manage carbon footprint across global operations. • Commitment to the importance of transparency.	A low score typically indicates one or more of the following: • Relatively new commitment to understanding climate-related criteria • Limited ability to disclose known risks or potential opportunities related to climate change • Limited ability to measure and manage the corporation's carbon footprint. • Possible reluctance to disclose certain requested information due to the commercial sensitivity.

corporations requesting for a measurement framework that could help them measure the impact at any stage in the life cycle of an operation unlike traditional Environmental Impact Assessments (EIAs) which are carried out more for due diligence (WBCSD and IFC, 2008). The outcome is a framework which is rooted in an approach that measures what a corporation does in terms of its activities across four areas namely governance and sustainability, assets, people and financial flows. This framework adopts a four-step methodology as shown in Fig. 3.

2.1.7. Greenhouse Gas Protocol (GHG Protocol)

Greenhouse Gas (GHG) Protocol was initiated through a joint-collaboration between the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI) to develop effective programs for tackling climate change. The GHG Protocol Corporate Accounting and Reporting Standard (WBCSD and WRI, 2004) provides a step-by-step guide for corporations to quantify and report on their emissions. These steps include: setting corporate goals and inventory; setting corporation boundaries - deciding whether an equity share approach or control approach should be adopted (see WBCSD and WRI, 2004 for details); setting operational boundaries – understanding scope 1, 2, and 3 emissions of a corporation; tracking emissions over time; managing inventory quality; accounting for GHG reductions; verifying GHG emissions and setting GHG targets.

2.1.8. Broad principle-based frameworks

Six broad principle-based frameworks which fulfil three attributes (1) mature (been in existence for at least 5 years) (2) implemented on a global scale and (3) have quantitative criteria are (Kessler, 1998):

- Natural Step
- Natural Capitalism
- Ecological Footprint
- CERES
- Sustainable Process Index
- 2001 Environmental Sustainability Index

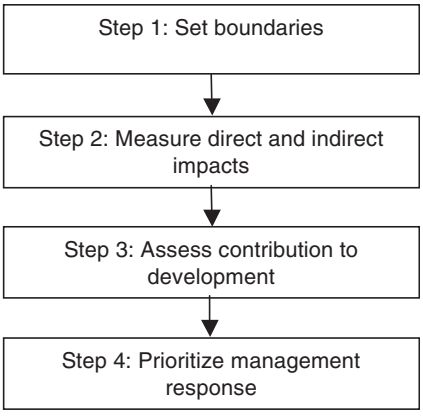

Fig. 3. WBCSD measuring impact framework (WBCSD and IFC, 2008).

The underlying principles behind these frameworks and their comprehensiveness (that is whether these frameworks cover all three main criteria on sustainability – economic, social and environmental) are summarised in Table 3.

Only two out of six of these frameworks (Natural Capitalism and CERES) incorporates Elkington's (1998) triple bottom line concept on sustainability (economic, social and environmental). The others (natural step, ecological footprint, sustainable process index and 2001 Environmental Sustainability Index) are predominantly focussed on the environment neglecting both social and economic criteria. CERES has been translated into what is now known as the Global Reporting Initiative (GRI). Although the natural capitalism framework has been in existence for quite awhile (since 1999) there are still criticisms about the measurement of principle three (manufactured function) and principle four (natural capital function) being too process orientated rather than performance based.

2.2. Standards

Standards exist to provide guidelines on best-in-class practices, some more specific than others. For example, standards that cover the social criteria are OECD Guidelines for Multinational Enterprises, UN Global Compact, EFQM, OHSAS 18001, AS/NZS 4801 and SA8000. Guidelines on the management of environmental criteria can be found across standards such as ISO14001 and EMAS. Table C1 (in Appendix C) summarises the incorporation of such standards across SRTs (Escrig-Olmedo et al., 2010). Only brief descriptions of some of the main standards are provided here, for details of other standards not covered in this paper see Escrig-Olmedo et al. (2010).

2.2.1. AA1000

The primary aim of the AA1000 (2008, p. 8) is to *'provide organisations with an internationally accepted, freely available set of principles to frame and structure the way in which they understand, govern, administer, implement, evaluate and communicate their accountability'*. There are three principles in AA1000 namely, the 'Principle of Inclusivity', the 'Principle of Materiality' and the

Table 3
Summary of sustainability frameworks (Kessler, 1998).

Principle-based frameworks	Principles	Comprehensiveness
Natural Step	Uses scientific principles/laws of nature to justify whether an act is sustainable.	No. Just environmental criteria.
Natural Capitalism	On the basis that an economy requires human, financial, manufactured and natural capital to function.	Yes
Ecological Footprint	Ecological footprint introduced as an accounting concept for ecological resources.	No. Just environmental criteria.
CERES	Represents a commitment for corporations to make continuous environmental efforts and be accountable for their environmental activities.	Yes
Sustainable Process Index	Primary focus is on anthropogenic material flows, renewable resources and the sustenance of a variety of species and landscapes.	No. Just environmental criteria.
2001 Environmental Sustainability Index	Components of environmental sustainability include environmental systems, reducing environmental stress, reducing human vulnerability and global stewardship.	No. Just environmental criteria.

'Principle of Responsiveness'.

A corporation is considered to adhere to the 'Principle of Inclusivity' (AA1000, p.11) when:

- It is committed to be accountable to those whom it has an impact or have an impact on it.
- It has in place a process for stakeholder participation (identifying and understanding stakeholders, identifying, implementing and developing appropriate, robust and balanced engagement strategies, establishes ways for stakeholders to be involved in decisions that serve to improve sustainability.
- It has in place necessary competencies and resources to conduct the process for stakeholder participation.
- The engagement with stakeholders result in them developing and achieving an accountable and strategic response to sustainability.

Adherence to the 'Principle of Materiality' is when a corporation (AA1000, p. 13):

- Has a materiality determination process in place (determines criteria from a wide range of sources such as the needs and concerns of stakeholders, societal norms, financial considerations etc.).
- Has in place or access to the necessary competencies and resources to apply the materiality determination process.
- The materiality determination process leads to a balanced understanding and prioritisation of material sustainability criteria.

A corporation is considered to adhere to the 'Principle of Responsiveness' (AA1000, p. 15) if it:

- Has in place a process for developing responses.
- Has access to necessary competencies and resources that would assist the corporation in achieving their commitments.
- Responses in a comprehensive (addresses the needs, concerns and expectations of stakeholders), balanced and timely manner.
- Has a process in place to communicate with stakeholders.

2.2.2. SA8000

The aim of SA8000 is to provide a standard according to international human rights norms and national labour laws so that employees within a corporation can stay protected and empowered. Other standards also addressing similar issues (not covered here) are ILO Convention 1 (Hours of Work), ILO Convention 29 (Forced Labour), ILO Convention 87 (Freedom of Association), Universal Declaration of Human Rights, The International Covenant on Economic, Social and Cultural Rights among others (SA8000, 2008). Given the existence of these standards, questions arise as to which standard dominates (or would be applicable) if a corporation had adopted all of them. The SA8000 guideline provides a resolution by clearly stating that *'a corporation shall comply with national and all applicable laws, prevailing standards and other requirements to which the corporation subscribes, and this standard (SA8000). When such and other applicable laws, prevailing industry standards, and other requirements to which the corporation subscribes, and this standard address the same issue, the provision most favourable to workers shall apply'* (SA8000, 2008, p.4).

The nine main criteria covered under SA8000 are child labour, forced and compulsory labour, health and safety, freedom of association and right to collective bargaining, discrimination, disciplinary practices, working hours, remuneration and management systems.

2.2.3. ISO 14001

ISO 14001:2004 provides a generic requirement for environmental management, which can be used as a common reference for communicating about environmental criteria with stakeholders. The standard itself does not specify the levels of environmental performance because this is believed to be specific depending on the nature of each activity.

2.2.4. ISO 9001

ISO 9001:2008 provides the requirements for quality management. To qualify, an entity must demonstrate an ability to consistently provide products that meet the needs of the customer, and adhere to applicable statutory and regulatory requirements. The entity must also demonstrate commitment to enhancing customer satisfaction, and have in place a process for continuous improvement.

2.2.5. AS/NZS 4801

AS/NZS 4801:2001 is an Australian/New Zealand standard for occupational health and safety management. This particular standard specifies requirements for an 'Occupational Health and Safety (OHS)' certificate that enables an entity to formulate policy and goals accounting for legislative requirements and information about risks and hazards.

2.2.6. EMAS

The Eco Management and Audit Scheme (EMAS) is a standard which encourages entities to evaluate, report and improve on their environmental performance. Environmental performance reporting must be done through an independently verified third party (EMAS, 2013).

2.2.7. OHSAS 18001

The Occupational Health and Safety Assessment Specification (OHSAS) 18001 is an international occupational health and safety

specification. Key areas addressed are: planning for hazard identification; risk assessment; training, awareness and competence; operational control; performance monitoring and improvement; consultation and communication with others (BSI, 2013).

3. Ratings and indices

Several rating tools exist in the market which attempts to measure ESG performance of corporations such as KLD, EIRIS, SAM, FTSE4Good, MSCI's ESG index, Asian Sustainability Reporting (ASR) inter alia. Of these reporting tools, only a handful actually discloses information about the criteria and methodology used behind their ESG measurements. A discussion of a few of these major tools and the areas of focus are summarised here for the reader.

3.1. KLD

KLD evaluates a corporation's environmental, social and governance performance. Its rating is designed using a binary scale where a value of "1" indicates the presence of a particular issue while "0" indicates the absence of an issue. KLD has its own independent research staff equipped with industry and issue specialties in areas such as the environment, community relations, employee programs and diversity, product safety and accessibility, labour relations, human rights and governance. The criteria explored are divided into two broad categories known as 'strengths' and 'concerns'. Typically, a KLD rating is derived by subtracting the 'concerns' from the 'strengths' to arrive at a single net value (see Hillman and Keim, 2001).

3.2. EIRIS

EIRIS functions as an independent, not–for-profit corporation which prides itself as a global leading provider of research into corporate environmental, social and governance criteria. It covers approximately 87 criteria including climate change, human rights, supply chain labour standards, relations with customers and suppliers, stakeholder engagement, board practices and risk management. Each item is rated on an interval scale as follows: -3 (High negative), -2 (Medium Negative), -1 (Low Negative), 0 (Neutral), 1 (Low Positive), 2 (Medium Positive) and 3 (High Positive) (EIRIS, 2011).

3.3. SAM

SAM rolls out a set of questionnaires which are specifically targeted at CEOs, investor relations, sustainability departments and public affairs. The ratings obtained through these surveys are weighted accordingly and forms the basis for the inclusion in the Dow Jones Sustainability Index (DJSI), one of the primary global indices used to track leaders in sustainability driven corporations (UNEP, 2011).

3.4. Asian Sustainability Rating (ASR)

ASR employs a proprietary set of 100 criteria surrounding sustainability and is grouped into four main criteria: general, environmental, social and governance. Scoring is done by a group of experienced investment analysts in Singapore where one point is awarded for every criterion on the list. Assessments are done solely based on publicly-available information such as regulatory filings and corporate websites and the data has to be within 18 months from the period the assessment is conducted (ASR, 2011).

3.5. Dow Jones Sustainability Index (DJSI)

DJSI was first launched in 1999 as a global sustainability benchmark. Firstly, the top 2500 corporations in terms of float-adjusted market capitalisation across industries/sectors are invited to participate in a corporate sustainability assessment based on SAM's questionnaire. Corporations are then filtered out as part of the DJSI construction process. The stock performance of the world's leading corporations in terms of social, economic and environmental (the DJSI family) is then monitored on a continuous basis. The process is shown in Fig. 4.

3.6. MSCI ESG indices

MSCI provides investment decision support tools to over 5000 clients on pension funds and hedge funds. MSCI generates scores for each applicable criterion (environmental, social and governance). These scores are then aggregated to form one composite ESG score which is mapped to a letter scale, much like the credit reporting structure where AAA represents the highest sustainability performance while C represents the lowest sustainability performance (MSCI, 2011).

3.7. FTSE4Good index

The FTSE4Good inclusion criteria was developed with similar aims as all the other tools which is to provide investors a means by which they could identify and invest in corporations that meet the minimum requirement of socially responsible practices. To be included in the FTSE4Good Index Series, corporations must be able to meet bare requirements in five core areas namely working towards environmental sustainability, upholding and supporting universal human rights, ensuring good supply chain labour standards, countering bribery and mitigating climate change. It liaises with experts in EIRIS and other network of international partners to research on corporate performance in ESG. Some of the noted research mechanisms involved are a review of annual reports, research of corporation websites and through written questionnaires and publicly available material (FTSE, 2011).

3.8. Bloomberg ESG disclosure scores

Up to 2010, Bloomberg's research into approximately 20,000 of the most capitalized corporations across 73 countries resulted in ESG data for only 3600 corporations (Suzuki and Levy, 2010). Suzuki and Levy (2010) note that although the response to Bloomberg's Sustainability Survey has been disappointingly low, corporations' coverage on ESG criteria have grown by approximately 11–12% annually. In an effort to encourage corporations to disclose more ESG data, Bloomberg decided to score corporations

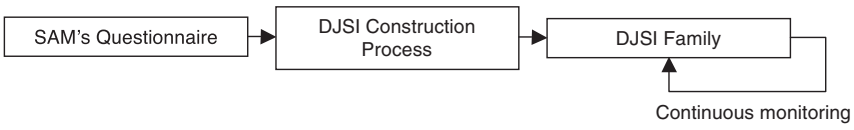

Fig. 4. DJSI corporate sustainability assessment (DJSI, 2011).

based on their ESG data disclosure. The Bloomberg ESG Disclosure Score out of a 100 is based on GRI's guidelines. There are four major categories namely Environmental Disclosure Score, Social Disclosure Score, Governance Disclosure Score and ESG Disclosure score (overall combination of Environmental, Social and Governance Disclosure Scores) (Suzuki and Levy, 2010). Weightings differ by sectors. For example, the omission of the number of fatalities would not be considered significant for a retail corporation but will be punitive for a corporation in the oil and gas sector. Eccles et al. (2011) study the market interest in Bloomberg's ESG data. They find that generally interest in environmental and governance information supersedes social information. Some of their findings of the global market interest in Bloomberg's ESG data is summarised in Appendix E.

3.9. Trucost

Trucost creates environmental profiles of corporations accounting for 464 industry sectors worldwide and monitors about 100 different types of environmental impacts (Trucost, 2013). There are four major steps in the evaluation process. The first step involves conducting a segmental analysis to identify a corporation's activities and accordingly assign revenues and costs to each of these activities. The second step involves creating an environmental profile depicting the corporation's direct and supply chain environmental impacts. The third step involves enhancing the profile developed by incorporating publicly-available sources such as annual reports and websites. Additionally, during this step, corporations are invited to verify the environmental profiles created for them. In the fourth and final step, Trucost generates a report on a corporation's environmental impacts and suggests areas requiring attention to reduce these impacts (Trucost, 2013). Not much information about these environmental profiles are disclosed in Trucost's website although Marquis and Toffel (2012) did highlight that Trucost have developed two environmental indicators namely an absolute disclosure ratio and a weighted disclosure ratio.

(i) Absolute disclosure ratio

'The absolute disclosure ratio is the proportion of relevant environmental indicators for which a corporation publicly discloses quantitative information. Trucost determines (a) the set of indicators relevant to a corporation based on the industries in which it operates (the denominator) and (b) the subset of those indicators that the corporation publicly discloses in (annual reports, regulatory filings and corporate websites)' (Marquis and Toffel, 2012, p 21).

(ii) Weighted disclosure ratio

'The weighted disclosure ratio takes this concept a step further by incorporating the extent of environmental impact associated with each environmental indicator. If Corporation A discloses only the ten least damaging indicators out of 20 and Corporation B discloses only the ten most damaging out of 20, they will have the same absolute disclosure ratio but very different weighted disclosure ratios, as Corporation A is concealing more important information … the weighted disclosure ratio shows how much of the most important information was disclosed' (Marquis and Toffel, 2012, p 22).

4. Summary of other non-formal SRTs in the corporate sector

Apart from the major SRTs discussed, there has been a growing body of research in this area (Roca and Searcy, 2012). For example, van Marrewijk and Hardjono (2003) introduce a framework to support corporate transformation towards more sustainable ways of doing business. Figge et al. (2002) present a balanced scorecard concept for sustainability management. In Figge et al.'s (2002) paper, the process and detailed steps involved in formulating a 'sustainability balanced scorecard' for a business unit is illustrated. Möller and Schaltegger (2005) promote the use of the balanced scorecard concept but with a focus on corporate environmental management. Dias-Sardinha and Reijnders (2001) suggest an evolutionary framework (dealing with strategic objectives such as compliance/pollution control, pollution prevention, eco-efficiency, eco-innovation, eco-ethics and sustainability) for evaluating environmental performance of corporations. Given that most SRTs are primarily for businesses, Lundberg et al. (2009) develop a framework on environmental performance measurement (using a combination of the causal-chain framework pressure-state-response and management by objectives) specifically for Swedish public sector corporations. Azzone et al. (1996) propose an integrated framework for environmental performance. In this framework, the four main criteria are state of the environment, corporate environmental policy, environmental management and eco-balance improvement. Radhari and Rostamy (2015) have identified 70 most common indicators in credible rating systems and guidelines. This study provides a building block to assess the usefulness of these indicators to companies and stakeholders in various contexts. Kowlowski et al. (2015) identified 87 corporate sustainability indicators. It was found that a majority of these indicators deal with performance in supply chain sustainability with lesser attention on business innovation and consumer engagement. The other contributions are summarised in Table A1.

5. Critique of corporate SRTs

One of the main problems with current corporate SRTs is the clear lack of standardization both in terms of criteria and methodology proposed. This gives rise to difficulty in comparing and benchmarking sustainability performance of corporations. Sharing this perception is Escrig-Olmedo et al. (2010)'s study which examine the different criteria proposed across sustainability ratings and indices. Delmas and Blass (2010) claim that some tools 'choose to focus on past or current measured performance while others put emphasis on the potential to improve future performance based on current management practices' (Delmas and Blass, 2010, p. 248). They also highlight that there is a trade-off between what can be measured and what should be measured, emphasising data availability as a concern. Morse and Fraser (2005) criticise the Environmental Sustainability Index (ESI) for creating a misleading impression that Western countries are more sustainable than developing countries, 'over-generalizing' the relative sustainability of different countries and promoting simplified conclusions on the relation between economic growth and environmental sustainability. Kolk et al. (2008) claim that neither the level of carbon disclosure that CDP promotes nor the more detailed carbon accounting provides valuable insights to investors, NGOs or policy makers. *'Carbon accounting is not very useful in understanding the market and technological risks and opportunities facing various corporations and sectors, while voluntary carbon disclosure remains inconsistent and difficult to interpret.'*(Kolk et al., 2008, p. 721).

A significant number of studies have critiqued the GRI framework. Moneva et al. (2006) analyse the performance criteria in GRI and conclude that there is an unbalance of emphasis between economic, social and environmental criteria. *'In this sense, it can be observed a socially biased reporting given that more than 50% are in this dimension (social)'* (Moneva et al., 2006, p. 131). They add that the concept of sustainable development underlying the GRI guidelines reveals the following problems: 'runs the risk of losing sight of the big picture for sustainability (globalisation, trade);

obscures the acquiring of an integrated view of business sustainability; contributes to the perception of the sustainable development concept from a reductionism approach placing the three criteria of sustainability (economic, social and environmental) at the same level and forgetting constituents interaction and participation; promotes the construction of a set of criteria instead of instilling business with values to change their mentality' (Moneva et al., 2006, p. 135). Dumay et al. (2010) share similar concerns with Moneva et al. (2006) and caution that GRI guidelines merely promote a 'managerialist' approach to sustainability and this in turn may lead corporations into an 'evaluatory trap'. That is, corporations are more concerned about how they perform based on the criteria rather than genuinely thinking about what they can do to further improve their efforts. Isaksson and Steimle (2009) argue that GRI guidelines do not consider the needs of the customers sufficiently and are hence inadequate in answering pertinent questions such as 'how sustainable a corporation is' or 'how quickly it is approaching sustainability'. Fonseca et al. (2012) perform 41 confidential semi-structured interviews with key informants (those who use, train, research, promote and provide services relating to sustainability assessment and reporting) and suggest the following improvements to the various aspects of the current GRI-based approach in sustainability reporting (see Table 4).

The inconsistency of sustainability reporting can be seen through a recent exploratory study on occupational health and safety (OHS) criteria by O' Neill et al. (2011). Their study reveals that different corporations have a tendency to adopt a variety of definitions and units of measurement for reporting on health and safety. Table 5 gives a summary of the findings of O'Neill et al. (2011) based on published reports for the years 1997, 2000, 2003 and 2006.

The inconsistency in reporting also occurs in other areas of sustainability. The authors' study of 10 sustainability reports of Australian corporations that have voluntarily participated in the Carbon Disclosure Project (CDP) reveals that there are differences in the reporting of greenhouse gas emissions, particularly with regard to the reporting time frame used, namely the fiscal year or the calendar year, the units used and the nature of information disclosed as shown in Table 6.

Much of corporate sustainability reporting can be viewed as a tool to hide actual practices; Bruno (1997) mentions a mammoth greenhouse gas emitter professing vigilant approaches to global warming, a world's leading ozone destroyer which takes credit for being a leader in ozone depletion, and a multinational corporation which cuts virgin rainforest, replaces it with monoculture plants and names the project 'sustainable forest development'. According to Milne and Patten (2002, p. 375) the proclaimed sustainability initiatives of some corporations merely act as 'a convincing facade to conceal the "back stage" activities' from a concerned public. A flow-on effect to this is the failure of ESG assessments relying on such reporting to truly distinguish the leaders from the laggards. Numerous studies examining the link between ESG practices as reported and corporate financial performance have yielded mixed conclusions, possibly because of the inadequacy of current reporting (Poelloe, 2010; Derwall et al., 2004; Gompers et al., 2003; Opler and Sokobin, 1995; Orlitzky et al., 2003; Bauer et al., 2006; Hamilton et al., 1993; Angel and Rivoli, 1997).

A number of publications (Laufer, 2003; Quirola and Schlup, 2001; Bruno, 1997; Beder, 1998; Walker and Wan, 2011; Roberts and Koeplin, 2007; Ramus and Montiel, 2005) highlight the issue of 'greenwashing', which is a term used to describe a strategy that corporations adopt when communicating with stakeholders on environmental criteria without really addressing the criteria (Walker and Wan, 2011). Beder (1998) identify a few characteristics of corporations involved in 'greenwashing' - a corporation may deliberately undermine the severity of the problem, disclose or publish wildly exaggerated claims or even acknowledge environmental problems but questions the availability of a solution that would help with addressing them. Anecdotal evidence suggests that unsubstantiated environmental and social disclosures may be more attributed to managing public relations rather than addressing corporate responsibilities (Deegan et al., 2002; O'Donovan, 2002; Brown and Deegan, 1998; Deegan and Gordon, 1996; Hooks et al., 2002; Adams, 2002).

Multi-criteria decision making (MCDM) refers to making decisions in the presence of conflicting criteria. MCDM problems involving sustainability are typically complicated and usually of large scale (Xu and Yang, 2001). A myriad of MCDM methods have been discussed in the literature taking into account uncertainties in scoring and weighting (Zopounidis, 2002). The development of corporate SRTs, however, have not progressed to account for uncertainty or possible differences in evaluator's opinion. From Appendix B (Table B1), a majority of SRTs appear to have ignored this aspect. Hyde et al. (2004) show that incorporating 'uncertainty' into multi-criteria decision making in water resources alters the resultant ranking of alternatives. Likewise, ignoring uncertainty in assessing corporations' sustainability performance may have a significant impact on the resultant ranking of corporations and ultimately their inclusion in sustainability indices. Hence, a more robust framework accounting for uncertainty in the assessment of sustainability performance is needed.

6. Conclusions and future research

This paper provides an overview of the criteria and methodology proposed by various corporate SRTs. Corporate SRTs can be divided into three categories namely, frameworks (principles and initiatives), standards as well as ratings and indices. As discussed, some of the existing deficiencies with SRTs include the lack of standardization which makes comparability difficult, corporations using SRTs to hide their actual practices, corporations deliberately manipulating stakeholders' perception through 'green-washing' and the lack of attention to uncertainty in the assessment of sustainability performance.

6.1. Future research

In light of this review, much remains to be done to enhance corporate SRTs and the current understanding of users of these tools. Some suggestions for future research include:

- Enhancing the measurability of criteria. Most criteria in corporate SRTs are qualitative (see Appendix D). Roca and Searcy (2012) explain that one of the reasons for the considerable doubt over the accuracy of sustainability reports is because of the relatively high degree of emphasis placed on qualitative information.
- Exploring the possibility of inter-linking different sustainability criteria. Lozano and Huisingh (2011) observe that a majority of the frameworks and standards address sustainability criteria through compartmentalisation, that is separating economic, environmental and social criteria. They argue that as a result of this divisive approach, sustainability efforts are not properly integrated.
- A majority of construction practitioners are just focussed on building/infrastructure SRTs which are used to gauge the environmental performance (i.e. emissions, water use etc) of buildings/infrastructure. This could be one of the main reasons behind the poor corporate disclosures among construction corporations. There is need to bridge the current gap and look at

avenues by which both corporate and building SRTs can interlock.
- The need to incorporate uncertainty/variability in current SRTs given that assessors' perceptions differ.
- The varying standards across global SRTs make comparability difficult. Having a common standard would assist in better benchmarking of corporations internationally. Future research could work on recommendations to facilitate this harmonisation.

Table 4
Critique of GRI's framework and suggestions for improvement (Fonseca et al., 2012).

Reporting aspects	Critique of GRI-based approach	Recommended approach
Guiding vision	Sustainability, overlooking the need to operate within the capacity of the biosphere	Sustainability, respecting the need to operate within the capacity of the biosphere
Conceptual framework	Tacit, non-systemic and issues-based	Explicit, geographically-based and scale-based
Evaluation of trade-offs	Overlooked	Assessed, justified and explained
Geographical scope	Weakly addressed	Implemented from local to global (regional/national-level and global level reports)
Temporal orientation	Predominantly retrospective	Includes forecasting or backcasting techniques
Type of criteria	Non-integrated, mostly pressure and response (referring to DPSIR)	Include integrated and non-integrated criteria, addressing pressure, state, response as well as relationships between them
Disclosures of assumptions and uncertainties	Very limited	Thorough

Table 5
Summary of health and safety criteria disclosed (O'Neill et al., 2011) (LTI = lost time due to injuries).

Corporation	Reported criteria	Definition
Corporation 1	Injury duration rate (1997)	Days per lost time injury
	Lost workdays (2003)	Lost workdays per 200,000 work hours
	Lost workday rate (2006)	Lost workdays per 200,000 man hours
Corporation 2	Duration rate (2006)	Measures the impact of injuries on people by the number of days they are away from their unrestricted duties per injury
Corporation 3	LTI severity rate (2003)	Full days lost in LTIs per million work hours (where LTI is injuries resulting in being absent from work for one or more complete days or shifts)
	LTI severity rate (2006)	Injury days lost per million exposure hours
Corporation 4	Hours lost % (2000)	Percentage of hours through lost injury
	Hours lost % (2003)	Percentage of hours lost due to workplace injury (as a % of hours worked)
	Hours lost % (2006)	Undefined
Corporation 5	Weighted average injury severity (2000)	Undefined
	Severity rate (2006)	Lost workday frequency rate plus the restricted workday frequency rate (days lost or with restricted duties because of a recordable case) per 200,000 h worked (however the graph for the data is titled: Lost workday case frequency rate (frequency per 200,000 h worked)
	Total days lost or restricted due to workplace injuries (2006)	
Corporation 6	Injury severity (2000)	Average working days lost per employee
	Injury severity (2003)	Hours lost per million hours worked
Corporation 7	Injury days lost (2000)	Not defined (but appears to be: total number of days lost to injury)
	Lost time injury severity rate (2000)	Days lost to injury per million hours worked
Corporation 8	Days lost to injury (2006)	Rate of days lost to injuries and restricted duty
Corporation 9	Injury severity (2006)	Undefined
Corporation 10	Serious personal injury (1997, 2000, 2003)	Undefined
	Prescribed incapacity (1997, 2000, 2003)	

Table 6
Differences in corporation reporting on greenhouse gas emissions. Carbon dioxide equivalent (CO2-e) is defined as a measure used to compare between greenhouse gas emissions depending on their global warming potential over a 100 years. Full time − equivalent (FTE) is defined as a unit which measures the workload of an equivalent full time worker.

Corporation	Time frame	Units	Nature of information disclosure
Corporation 11	2007, 2008, 2009, 2010	Million tonnes CO2-e	Distinction made in reporting of scope 1 and 2 emissions
Corporation 12	2007, 2008, 2009, 2010	Million tonnes CO2-e	Report on scope 1 and 2 emissions, indicating corrections from previous years as well.
Corporation 13	2007/2008, 2008/2009	Tonnes CO2-e	Distinction made in emissions based on different sources (diesel, electricity, petrol and gas)
Corporation 14	2007/2008, 2008/2009, 2009/2010	Kilo tonnes CO2-e	Distinction made in reporting of scope 1 and 2 emissions.
Corporation 15	2008, 2009, 2010	Tonnes CO2-e/tonne of production	Emissions of total carbon dioxide equivalent per tonne of production
Corporation 16	2007/2008, 2008/2009, 2009/2010, Target 2010/2011	Tonnes CO2-e/MWH	Carbon intensity of operated generation portfolio.
Corporation 17	2007, 2008, 2009, 2010	Tonnes CO2-e	Distinction made in reporting of scope 1 and 2 emissions.
Corporation 18	2009, 2010, 2011	Tonnes CO2-e and Tonnes CO2-e/FTE	Gross emissions, additional emissions, and gross emissions per FTE
Corporation 19	2007, 2008, 2009, 2010	Tonnes CO2-e/FTE	Carbon emissions per FTE
Corporation 20	2008, 2009, 2010	Tonnes CO2-e	No clear distinction of scope 1 and 2 emissions.

Table A1
Frameworks for CSR reporting.

No	Papers	Contribution	Link
1	Revisiting a Corporate Sustainability Framework in an Integrated Reporting Era: A Diversified Resources Firm Perspective.	Suggest integrated sustainability criteria to enable integrated reporting.	http://mams.rmit.edu.au/fmcbjd8rlgvw1.pdf
2	Integrating Corporate Social Responsibility into ISO Management System- In Search of a Feasible CSR Management System Framework.	CSR framework based on process and systems thinking and analogous to ISO 9001:2000.	http://www.emeraldinsight.com/journals.htm?articleid=842110&show=abstract
3	Designing and Implementing Corporate Social Responsibility: An Integrative Framework Grounded in Theory and Practice.	Nine steps for CSR design and implementation process.	http://www.springerlink.com/content/10261740n1u64n13/
4	Developing a Framework for Sustainable Development Criteria for the Mining and Minerals Industry.	Suggest a framework for performance assessment and improvements specifically in the mining industry.	http://www.sciencedirect.com/science/article/pii/S0959652603000751
5	An Extended Performance Reporting Framework for Social and Environmental Accounting.	Extend on three reporting approaches – intellectual capital (IC), balanced scorecard as well as social and environmental reporting.	http://onlinelibrary.wiley.com/doi/10.1002/bse.541/abstract
6	Extended Performance Reporting: Evaluating Corporate Social Responsibility and Intellectual Capital Management.	Extend performance reporting framework to the Australian food and beverage industry.	http://iiste.org/Journals/index.php/ISEA/article/view/890
7	Discovering Patterns in Corporate Social Responsibility (CSR) Reporting: A Transparent Framework Based on the GRI's Sustainability Reporting Guideline.	Two-dimensional framework based on GRI and different types of disclosures-Values and Principles, Management Approach and Future Plans.	http://www.feb.ugent.be/nl/Ondz/WP/Papers/wp_09_557.pdf
8	Green accounting-A New Dimension in the Performance and Activity Reporting of the Enterprise.	Expands on the concept of performance beyond the financial criteria and more towards social and environmental criteria.	http://anale-economie.spiruharet.ro/files/anale/Issue2_2011.pdf#page=149
9	Towards a Balanced CSR Performance Management Framework.	Suggest CSR performance measurement framework based on the adoption of the BSC.	http://arvis.simor.ntua.gr/Attachments/Publications/Conferences/meperilipsistapraktika/7.8.4_TOWARDS%20A%20BALANCED%20CSR%20PERFORMANCE%20MEASUREMENT%20FRAMEWORK.pdf
10	Environmental Sustainability Criteria: A Reporting Tool of Corporate Social Responsibility.	Outline of key environmental sustainability criteria.	http://fse.tibiscus.ro/anale/Lucrari/115.pdf
11	Criteria of Sustainable Development for Industry: A General Framework.	Framework provides link between macro and micro aspects of sustainable development.	http://www.sciencedirect.com/science/article/pii/S0957582000708834
12	Evaluating the Sustainability of Complex Socio-Environmental Systems- the MESMIS Framework.	A cyclic framework which integrates evaluation into decision making and improves the likelihood of success in the implementation of developmental projects.	http://www.sciencedirect.com/science/article/pii/S1470160X02000432
13	Sustainability Accounting – A Brief History and Accounting Framework.	A review of sustainability accounting framework.	http://www.sciencedirect.com/science/article/pii/S0155998204000808
14	Measuring Strategic Environmental Performance.	Developed a set of information which can be used for managerial control focussed on the environmental performance of an industrial firm.	http://onlinelibrary.wiley.com/doi/10.1002/bse.3280030101/abstract
15	Sustainability in Action: Identifying and Measuring Key Performance Drivers.	Framework describes drivers of corporate social performance, the actions managers can take and consequences of those actions.	http://www.sciencedirect.com/science/article/pii/S002463010100084X
16	Environmental Criteria for Business: A Review of the Literature and Standardisation Methods.	Proposes that environmental information can fall into one of the following: economic criteria, physical impact criteria, linear programming methods and economic valuation methods.	http://www.sciencedirect.com/science/article/pii/S0959652601000051
17	The Link between 'Green' and Economic Success: Environmental Management As the Crucial Trigger between Environmental and Economic Management.	Presents theoretical framework to explain co-existence of two views (environmental performance causes extra costs and at the same time improved performance) - argue that both environmental performance and management are important.	http://www.sciencedirect.com/science/article/pii/S0301479702905554

18	Measuring Corporate Sustainability.	Provides practical advice on how businesses can adapt and improve current environmental accounting and reporting practices.	http://www.tandfonline.com/doi/abs/10.1080/09640560010694
19	Evaluation of Corporate Environmental Management Approaches: A Framework and Application.	Proposes that environmental risks are evaluated using two dimensions; endogenous from internal operations of corporation and exogenous from a corporation's external world such as location, ecological setting and demographic characteristics.	http://www.sciencedirect.com/science/article/pii/0925527396000400
20	The Sweet Spot in Sustainability: A Framework for Corporate Assessment in Sugar Manufacturing	Proposed a framework to assesss corporate sustainability within the Thai sugar industry.	http://www.tandfonline.com/doi/full/10.1080/09537287.2015.1015470
21	Corporate Sustainability: An Integrative Definition and Framework to Evaluate Corporate Practice and Guide Academic Research	Proposed a framework to embed sustainability into corporate strategy, highlights synergy between innovation and sustainability and includes economy, ecology-environment, equity social in strategy and design.	http://www.sciencedirect.com/science/article/pii/S0959652614001607
22	Two Dimensions of Corporate Sustainability Assessment: Towards a Comprehensive Framework	Introduced two dimensions: sustainability performance and governance.	http://onlinelibrary.wiley.com/doi/10.1002/bse.726/abstract

Table B1
Analysis of selected corporate SRTs.

No.	SRT	Framework (F), Standards (S) or Rating and Indices (RI)	Nature of SRT		Comments
			Deterministic scoring for criteria	Weighting	
1	GRI	F	X	N/A	Provides a comprehensive reporting framework for environmental, social and governance disclosures. Several versions the framework exists now. There are three application levels namely A, B and C depending on a corporation's extent of disclosures and also takes into account whether the report produced has received third party verification in which case it will be given a '+
2	DJSI	RI	X	N/A	Uses SAM's questionnaire to determine the inclusion of corporations in this index.
3	CDP	F	X	N/A	Database containing information relating to greenhouse gas emissions, water use and climate change strategies. Carbon disclosures scores normalised to a 100 point scale.
4	ISO 14001	S	N/A	N/A	Provides a generic requirement for environmental management systems.
5	KLD	RI	X	N/A	Adopts a binary scale to indicate the absence or presence of an issue across several criteria.
6	EIRIS	RI	X	Optional	A framework covering approximately 87 criteria (environmental, social and governance)
7	SAM	RI	N/A	N/A	A set of questionnaire distributed annually to gauge the sustainability performance of corporations.
8	MSCI ESG Indices	RI	X	N/A	Investment decision support tool for pension and hedge funds.
9	FTSE4Good Indices	RI	X	N/A	Uses EIRIS' framework to determine the inclusion of corporations in this index.
10	ASR	RI	X	N/A	A framework containing approximately more than 100 criteria and assessments of corporations are done solely based on publicly-available information.

Table C1
International standards and frameworks embedded (Escrig-Olmedo et al., 2010).

International Standards/Framework	ASPI	Calvert	DJSI	Ethibel	FTSE4Good	KLD Domini 400	Accountability	Asset4	ECP	EIRIS	Innovest	KLD	Oekom	SAM	SiRi	Viego
EFQM Excellence Model															√	
OECD Guidelines for Multinational Enterprises	√	√	√	√	√					√	√		√	√		√
UN Global Compact				√			√	√		√	√		√		√	
UN PRI			√			√		√		√	√		√		√	
UN Declaration of Human Rights	√	√	√	√	√			√	√	√	√		√	√	√	√
SA8000					√						√		√			
AA1000							√			√						
ISO14000			√		√	√				√	√	√	√	√	√	√
ISO9000										√			√		√	
EMAS			√		√								√	√		
ILO Core Labour Standards	√	√	√	√	√				√	√	√		√	√	√	√
OHSAS						√						√			√	
Kyoto Protocol	√		√	√						√			√			√
Millennium Development Goals (MDG)	√			√												√
Agenda 21	√		√	√												√
Rio Declaration	√		√	√							√					√
UN Charter and Treaties	√			√												√
International Financial Reporting Standards (IFRS)								√								
International Codes of Corporate Governances								√								
NGOs	√		√	√	√			√	√		√		√	√	√	√

Table D1
Qualitative criteria for GRI.

Criteria	Code	Description
Economic Performance	EC2	Financial implications and other risks and opportunities for the corporation's activities due to climate change.
	EC3	Coverage of the corporation's defined benefit plan obligations.
	EC4	Significant financial assistance received from government
Biodiversity	EN12	Description of significant impacts of activities, products, and services on biodiversity in protected areas and areas of high biodiversity value outside protected areas.
	EN13	Habitats protected or restored.
	EN14	Strategies, current actions, and future plans for managing impacts on biodiversity.
Emissions, Effluents and Waste	EN18	Initiatives to reduce greenhouse gas emissions and reductions achieved.
Employment	LA3	Benefits provided to full-time employees that are not provided to temporary or part-time employees, by major operations.
Occupational Health and Safety	LA8	Education, training, counselling, prevention, and risk-control programs in place to assist workforce members, their families, or community members regarding serious diseases.
	LA9	Health and safety topics covered in formal agreements with trade unions.
Training and Education	LA11	Programs for skills management and lifelong learning that support the continued employability of employees and assist them in managing career endings.
Child Labour	HR6	Operations identified as having significant risk for incidents of child labour, and measures taken to contribute to the elimination of child labour.
Customer Health and Safety	PR1	Life cycle stages in which health and safety impacts of products and services are assessed for improvement, and percentage of significant products and services subject to such procedures.

Table E1
Global market interest (Eccles et al., 2011)

Variables	Hits
ESG disclosure score	2,395,230
GHG scope 1	1,520,488
Governance disclosure score	1,337,708
Environmental disclosure score	1,238,417
GHG scope 2	1,067,085
Social disclosure score	978,541
Total GHG emissions	920,170
% Independent directors	899,148
GHG scope 3	890,932
Size of the board	735,853
Number of independent directors	651,913
Verification type	645,330
UN Global Compact signatory	606,998
Board meeting % Attendance	540,427
Number of board meetings for the year	519,099
CEO duality	508,482

Appendix F. Acronyms

ASR Asian Sustainability Rating
CDP Carbon Disclosure Project
CERES Coalition for Environmentally Responsible Economies
DJSI Dow Jones Sustainability Index
DPSIR Driving Forces, Pressures, States, Impacts and Responses
EFQM European Foundation for Quality Management
EIA Environmental Impact Assessment
EIRIS Ethical Investment Research and Information Service
EMAS Eco Management and Audit Scheme
ESG Environmental, social and governance
FTSE Financial Times Stock Exchange
GHG Greenhouse gases
GRI Global Reporting Initiative
KLD Kinder Lydenberg Domini
OECD Organisation for Economic Cooperation and Development
OHS Occupational Health and Safety
OHSAS Occupational Health and Safety Assessment Specification
SAM Sustainable Asset Management
SRT Sustainability Reporting Tools
UN PRI United Nations Principles of Responsible Investment
WBCSD World Business Council of Sustainable Development

References

AA1000, 2008. AA1000 Accountability Principles Standard 2008. AccountAbility, London viewed on 15 December 2012. http://www.accountability.org/standards/index.html.

Adams, C.A., 2002. Internal organisational factors influencing corporate social and ethical reporting: beyond current theorising. Account. Audit. Account. J. 15 (2), 223–250.

Adams, C., Narayanan, V., 2007. In: O'Dwyer, B., Bebbington, J., Unerman, J. (Eds.), The 'Standardization' of Sustainability Reporting, cited in *Sustainability Accounting and Accountability*. Routledge, Oxen, pp. 70–85.

Angel, J., Rivoli, P., 1997. Does ethical investing impose a cost upon a firm? a theoretical examination. J. Invest. 6 (4), 57–61.

Asian Sustainability Rating, 2011. Research Methodology. Asian Sustainability Rating Ltd, Berkhamsted, UK viewed on 9 March 2012, URL: http://www.asiansr.com/Methodology.html.

AS/NZS 4801, 2001. Occupational Health and Safety Management Systems – Specification with Guidance for Use. Standards Australia, Sydney viewed on 16 October 2012. http://infostore.saiglobal.com/store2/Details.aspx?ProductID=386329.

Azzone, G., Noci, G., Manzini, R., Welford, R., Young, C.W., 1996. Defining environmental performance indicators: an integrated framework. Bus. Strategy Environ. 5 (2), 69–80.

Bartlett, A.A., 1998. Malthus marginalized: the massive movement to marginalize man's message. Soc. Contract 8 (3), 239–252.

Bauer, R., Derwall, J., Otten, R., 2006. The ethical mutual fund performance debate: new evidence from Canada. J. Bus. Ethics 70 (2), 111–124.

Beder, S., 1998. Manipulating public knowledge. Metascience 7 (1), 132–139.

Brown, N., Deegan, C.M., 1998. The public disclosure of environmental performance information – a dual test of media agenda setting theory and legitimacy theory. Account. Bus. Res. 29 (1), 21–41.

Brundtland Report, 1987. Report of the World Commission on Environment and Development: Our Common Future. United Nations, New York viewed 10 September 2011. http://conspect.nl/pdf/Our_Common_Future-Brundtland_Report_1987.pdf.

Bruno, K., 1997. The world of Greenwash, *CorpWatch*, cited in Laufer, W.S. (2003), social accountability and corporate greenwashing. J. Bus. Ethics 43 (3), 253–261.

BSI, 2013. OHSAS 18001 Occupational Health and Safety. BSI, London viewed on 24 January 2013. http://www.bsigroup.com.au/en-au/Assessment-and-Certification-services/Management-systems/Standards-and-schemes/OHSAS-18001/.

Carbon Disclosure Project (CDP), 2010. Carbon Disclosure Project 2010: Global 500 Report. CDP, UK viewed on 28 January 2013. https://www.cdproject.net/CDPResults/CDP-2010-G500.pdf.

Chester and Woofter, 2005. Non-Financial Disclosure and Strategic Planning: Sustainability Reporting for Good Corporate Governance. Master's Thesis. School of Engineering, Blekinge Institute of Technology, Karlskrona, Sweden.

Deegan, C., Gordon, B., 1996. A study of the environmental disclosure policies of

Australian corporations. Account. Bus. Res. 26 (3), 187–199.
Deegan, C., Michaela, R., Tobin, J., 2002. An examination of the corporate social and environmental disclosures of BHP from 1983-1997. Account. Audit. Account. J. 15 (3), 312–343.
Delmas, M., Blass, V.D., 2010. Measuring corporate environmental performance: the trade-offs of sustainability ratings. Bus. Strategy Environ. 19 (4), 245–260.
Derwall, J., Gunster, N., Bauer, R., Koedijk, K., 2004. The Eco-Efficiency Premium Puzzle, Erasmus Research Institute of Management. Erasmus University, Rotterdam. Report Series – Research in Management, ERS-2004-043-F&A.
Dias-Sardinha, I., Reijnders, L., 2001. Environmental performance evaluation and sustainability performance evaluation of organizations: an evolutionary framework. Corp. Soc. Responsib. Environ. Manag. 8 (2), 71–79.
Dumay, J., Guthrie, J., Farneti, F., 2010. GRI sustainability reporting guidelines for public and third sector organizations. Public Manag. Rev. 12 (4), 531–548.
Eccles, R.G., Krzus, M.P., Serafeim, G., 2011. Market interest in nonfinancial information. J. Appl. Corp. Finance 23 (4), 113–127.
EMAS, 2013. What Is EMAS? European Commission, Brussels viewed on 23 January 2013. http://ec.europa.eu/environment/emas/index_en.htm.
EIRIS, 2011. EIRIS Organisation, EIRIS Foundation and Ethical Investment Research Services. London, viewed on 9 March 2012, URL: http://www.eiris.org/about_us.html.
Escrig-Olmedo, E., Munoz-Torres, M.J., Fernandez-Izquierdo, M.A., 2010. Socially responsible investing: sustainability indices, ESG rating and information provider agencies. Int. J. Sustain. Econ. 2 (4), 442–461.
Figge, F., Hahn, T., Schaltegger, S., Wagner, M., 2002. The sustainability balanced scorecard – linking sustainability management to business strategy. Bus. Strategy Environ. 11 (5), 269–284.
Financial Times Stock Exchange (FTSE), 2011. Good Index Series Inclusion Criteria. FTSE the Index Company, London viewed on 20 March 2012. http://www.ftse.com/Indices/FTSE4Good_Index_Series/Downloads/F4G_Criteria.pdf.
Finch, N., 2005. The Motivations for Adopting Sustainability Disclosure viewed on 7 August 2015. http://papers.ssrn.com/sol3/Papers.cfm?abstract_id=798724.
Fonseca, A., McAllister, M.L., Fitzpatrick, P., 2012. Sustainability reporting among mining corporations: a critique of the GRI approach. J. Clean. Prod. (in press), viewed on 13 February 2013 http://www.sciencedirect.com/science/article/pii/S0959652612006440.
Global Reporting Initiative (GRI), 2011. Sustainability Reporting Guidelines v3.1. GRI, Amsterdam viewed on 24 January 2013. https://www.globalreporting.org/resourcelibrary/G3.1-Sustainability-Reporting-Guidelines.pdf.
Gompers, P.A., Joy, L.I., Andrew, M., 2003. Corporate governance and equity prices. J. Econ. 118 (1), 107–155.
Hamilton, S., Hoje, J., Statman, M., 1993. Doing well while doing good? the investment performance of socially responsible mutual funds. Financial Anal. J. 49 (6), 62–66.
Hillman, A.J., Keim, G.D., 2001. Shareholder value, stakeholder management, and social criteria: what's the bottom line? Strategic Manag. J. 22 (2), 125–139.
Hooks, J., David, C., Howard, D., 2002. The information gaps in annual reports. Account. Audit. Account. J. 15 (4), 501–522.
Hyde, K.M., Maier, H.R., Colby, C.B., 2004. Reliability – based approach to multicriteria decision analysis for water resources. J. Water Resour. Plan. Manag. 130 (No. 6), 429–438.
International Institute for Sustainable Development (IISD), 1992. Business Strategy for Sustainable Development: Leadership and Accountability for the '90s. IISD, Winnipeg, Canada viewed on 28 January 2013. http://www.iisd.org/business/pdf/business_strategy.pdf.
Isaksson, R., Steimle, U., 2009. What does GRI-reporting tell us about corporate sustainability? TQM J. 21 (2), 168–181.
ISO9001, 2008. Quality Management Systems – Requirements. ISO, Geneva, Switzerland viewed on 16 December 2011. http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=46486.
ISO14001, 2004. Environmental Management Systems - Requirements with Guidance for Use. ISO, Geneva, Switzerland viewed on 16 December 2011. http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=31807.
Kessler, J.J., 1998. Monitoring of Environmental Qualities in Relation to Development Objectives. SNV Netherlands Development Organisation, The Hague, Netherlands.
Kolk, A., Levy, D., Pinkse, J., 2008. Corporate responses in an emerging climate regime: the institutionalization and commensuration of carbon disclosure. Eur. Account. Rev. 17 (4), 719–745.
Kowlowski, A., Searcy, C., Bardecki, M., 2015. Corporate sustainability reporting in the apparel industry: an analysis of indicators disclosed. Int. J. Prod. Perform. Manag. 64 (3), 377–397.
Kristensen, P., 2004. The DPSIR Framework. UNEP, Kenya viewed on 12 December 2011. http://enviro.lclark.edu:8002/rid=1145949501662_742777852_522/DPSIR%20Overview.pdf.
Laufer, W.S., 2003. Social accountability and corporate greenwashing. J. Bus. Ethics 43 (3), 253–261.
Lozano, R., Huisingh, D, 2011. Inter-linking issues and dimensions in sustainability reporting. J. Clean. Prod. 19 (2–3), 99–107.
Lundberg, K., Balfors, B., Folkeson, L., 2009. Framework for environmental performance measurement in Swedish public sector organization. J. Clean. Prod. 17 (11), 1017–1024.
Marlin, J.T., Marlin, A.T., 2003. A Brief History of Social Reporting viewed 26 July 2011. http://www.mallenbaker.net/csr/page.php?Story_ID=857.
Marquis, C., Toffel, M.W., 2012. When Do Firms Greenwash? Corporate Visibility, Civil Society Scrutiny, and Environmental Disclosure. Harvard Business School Organizational Behavior Unit Working Paper No. 11-115; MA, U.S., viewed on 29 January 2013. http://ssrn.com/abstract=1836472. http://dx.doi.org/10.2139/ssrn.1836472. or.
Milne, J.M., Patten, D.M., 2002. Securing organizational legitimacy: an experimental decision case examining the impact of environmental disclosures. Account. Audit. Account. J. 15 (3), 372–405.
Morse, S., Fraser, E.D.G., 2005. Making 'Dirty' nations look clean? the nation state and the problem of selecting and weighting indices as tools for measuring progress towards sustainability. Geoforum 36 (5), 625–640.
Möller, A., Schaltegger, S., 2005. The sustainability balanced scorecard as a framework for eco-efficiency analysis. J. Industrial Ecol. 9 (4), 73–83.
Moneva, J.M., Archel, P., Correa, C., 2006. GRI and the camouflaging of corporate unsustainability. Account. Forum 30 (2), 121–137.
MSCI, 2011. ESG Research Methodology. MSCI Inc, New York viewed on 18 December 2011, URL: http://www.msci.com/products/indices/thematic/esg/esg_research_methodology.html.
Nikolaeva, R., Bicho, M., 2011. The role of institutional and reputational factors in the voluntary adoption of corporate social responsibility reporting standards. J. Acad. Mark. Sci. 39 (1), 136–157.
O'Donovan, G., 2002. Environmental disclosures in the annual report: extending the applicability and predictive power of legitimacy theory. Account. Audit. Account. J. 15 (3), 344–371.
OECD, 2003. OECD Environmental Indicators. OECD, Paris viewed on 14 February 2013. http://www.oecd.org/environment/indicators-modelling-outlooks/24993546.pdf.
O'Neill, S., Clarke, K., Flanagan, J., 2011. Are Managers of Large Corporations Accountable to Stakeholders for the Financial Paradox of OHS Risk? Dynamics of Investing Responsibly Research Forum. University of Sydney, Sydney, 24–25 November 2011.
Opler, T.C., Sokobin, J., 1995. Does Coordinated Institutional Activism Work? An Analysis of the Activities of the Council of Institutional Investors. In: Dice Center for Research in Financial Economics Working Paper Series 95-5. Ohio State University, Columbus, Ohio.
Orlitzky, M., Schmidt, F.L., Rynes, S.L., 2003. Corporate social and financial performance: a meta analysis. Organ. Stud. 24 (3), 403–441.
Özdemir, E.V., Härdtlein, M., Jenssen, T., Zech, D., Eltrop, L., 2011. A confusion of tongues or the art of aggregating indicators – reflections on four projective methodologies on sustainability assessment. Renew. Sustain. Energy Rev. 15 (5), 2385–2396.
Poelloe, A., 2010. Is There a Trade-off between Social Responsibility and Financial Performance? Master thesis in Economics and Business Erasmus University, Rotterdam.
Quirola, D., Schlup, M., May 2001. WS19-Sustainability Reporting – Beyond Greenwash. ERCP, Lund, Sweden.
Radhari, A.H., Rostamy, A.A.A., 2015. Designing a general set of sustainability indicators at the corporate level. J. Clean. Prod. (in press).
Ramus, C.A., Montiel, I., 2005. When are corporate environmental policies a form of "Greenwashing"? Bus. Soc. 44 (4), 377–414.
Roberts, D.H., Koeplin, J.P., 2007. Sustainability reporting practices in Portugal: greenwashing or triple bottom line? Int. Bus. Econ. Res. J. 6 (9), 29–40.
Robinson, J., 2004. Squaring the circle? some thoughts on the idea of sustainable development. Ecol. Econ. 48 (4), 369–284.
Roca, L.C., Searcy, C., 2012. An analysis of indicators disclosed in corporate sustainability reports. J. Clean. Prod. 20 (1), 103–118.
SA8000, 2008. Social Accountability 8000. Social Accountability International (SAI), New York viewed on 16 June 2012. http://www.sa-intl.org/_data/n_0001/resources/live/2008StdEnglishFinal.pdf.
SIGMA Guidelines, 2008. The SIGMA Guidelines: Putting Sustainable Development Nito Practice– A Guide for Organisations. The SIGMA Project, London viewed on 13 June 2012. http://www.projectsigma.co.uk/.
Siew, R.Y.J., Balatbat, M.C.A., Carmichael, D.G., 2013. The relationship between sustainability practices and financial performance of construction companies. Smart Sustain. Built Environ. 2 (1), 6–27.
Siew, R.Y.J., 2014. Evaluating and Enhancing the Impact of Sustainability Reporting Tools (SRTs). School of Civil and Environmental Engineering, The University of New South Wales (UNSW). PhD Thesis.
Singh, R.K., Murty, H.R., Gupta, S.K., Dikshit, A.K., 2009. An overview of sustainability assessment methodologies. Ecol. Indic. 9 (2), 189–212.
Suzuki, H., Levy, R., 2010. ESG USA 2010: Global Trends and US Sustainable Investing. Responsible Investor, London viewed on 29 January 2013. http://www.responsible-investor.com/images/uploads/reports/ESG_USA_2010.pdf.
Székely, F., Knirsch, M., 2005. Responsible leadership and corporate social responsibility: metrics for sustainable performance. Eur. Manag. J. 23 (6), 628–647.
Trucost, 2013. Our Methodology. Trucost, London viewed on 29 January 2013. http://www.trucost.com/methodology.
United Nations Environment Programme (UNEP), 2011. Understanding Corporate Sustainability Disclosure Requests. UNEP, Kenya viewed on 15 December 2011. http://www.unepfi.org/fileadmin/documents/if_you_ask_us.pdf.
United Nations Environment Programme (UNEP), 2006. Training Manual on Integrated Environmental Assessment and Reporting in Africa viewed on 14 February 2013. http://www.unep.org/geo/pdfs/IEA_Africa_training_manual.pdf.
United Nations Global Compact (UNGC), 2011. The Ten Principles. Foundation of the

Global Compact, New York viewed on 16 June 2012. http://www.unglobalcompact.org/AboutTheGC/TheTenPrinciples/index.html.
van Marrewijk, M., 2003. Concepts and definitions of CSR and corporate sustainability: between agency and communion. J. Bus. Ethics 44 (2–3), 95–105.
van Marrewijk, M., Hardjono, T.W., 2003. European corporate sustainability framework for managing complexity and corporate transformation. J. Bus. Ethics 44 (2–3), 121–132.
Waddock, S., 2003. Stakeholder performance implications of corporate responsibility. Int. J. Bus. Perform. Manag. 5 (2–3), 114–124.
Walker, K., Wan, F., 2011. The harm of symbolic actions and Green-Washing: corporate actions and communications on environmental performance and their financial implications. J. Bus. Ethics 109 (2), 227–242.
Wallner, H.P., 1999. Towards sustainable development of industry: networking, complexity and eco-clusters. J. Clean. Prod. 7 (1), 49–58.
WBCSD and IFC, 2008. Measuring Impact Framework Methodology: Understanding the Business Contribution to Society. WBCSD, Geneva, Switzerland viewed on 15 January 2013. http://www.wbcsd.org/pages/edocument/edocumentdetails.aspx?id=205&nosearchcontextkey=true.
WBCSD and WRI, 2004. The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard. WBCSD and WRI, Geneva, Switzerland viewed on 17 January 2013. http://www.ghgprotocol.org/files/ghgp/public/ghg-protocol-revised.pdf.
Xu, L., Yang, J.-B., 2001. Introduction to Multi-Criteria Decision Making and the Evidential Reasoning Approach, Working Paper. University of Manchester Institute of Science and Technology viewed on 10 August 2015. https://phps.portals.mbs.ac.uk/Portals/49/docs/jyang/XuYang_MSM_WorkingPaperFinal.pdf.
Zopounidis, C., 2002. MCDA methodologies for classification and sorting. Eur. J. Oper. Res. 138 (2), 227–458.