

# **Requirements and Barriers to Strengthening Sustainability Reporting among Mining Corporations**

by

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I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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## Abstract

Mining depletes, processes, and relocates mineral resources while profoundly changing landscapes and socio-economic patterns of affected regions and communities. For millennia these impacts have been “accepted” by society because of minerals’ many benefits, but the growing environmental crisis is pushing up demand for socially responsible and ecologically viable mining practices. In reaction to these pressures, large mining corporations have been increasingly trying to make the business case for a sustainable mining industry. To demonstrate progress towards this “case”, companies have started to publish sustainability reports based on a sustainability assessment and reporting tool called the Global Reporting Initiative (GRI) Framework.

Many scholars have contested the effectiveness of that framework and argued that GRI-based reports can mislead decision-makers concerned with sustainability, or even camouflage unsustainable practices, particularly at the site level. Few scholars, however, have gone far beyond the realm of criticism to understand how to enhance that framework. This thesis addresses this gap. More specifically it sets out to answer the following questions: 1) what needs to be changed in mining corporations’ approaches to assessing and reporting sustainability for the purpose of promoting more meaningful and reliable disclosures? And 2) what are the key practical and conceptual barriers to implementing those changes?

This research adopted a qualitative grounded theory approach underpinned by systems theories to answer the questions. Data were collected through extensive literature reviews, 41 semi-structured interviews and content analyses. The evaluation of data included software-aided techniques such as iterative coding, memo-writing, and diagramming.

The four main contributions are as follows. First, the thesis presents an evaluation of the extent to which mining corporations’ approaches to sustainability reporting meet eight principles (the BellagioSTAMP) of sustainability assessment and communication. In light of the identified gaps, the thesis outlines a number of specific changes that should be promoted in mining corporations’ sustainability frameworks. Second, a critical evaluation is provided of the

limitations of an industry initiative that is pushing for stronger GRI reporting. Proponents of that initiative are trying to standardize and enforce external verification of sustainability reports among large mining corporations, but, in doing so, they may reinforce a limited approach to sustainability reporting. Third, the thesis identifies and discusses the barriers that may emerge in the implementation of six additional guidance elements in the GRI framework that could promote sounder sustainability assessment and reporting processes. The many barriers are broadly categorized as motivational, structural and specific. Finally, the thesis specifies research implications for key stakeholder groups involved in sustainability reporting: standard-setters, industry associations, mining companies, external verifiers, investors, local communities, and scholars.

Overall, this thesis corroborates the view that meaningful and reliable standardized disclosures of contributions to sustainability are unlikely to emerge any time soon. The geographical dispersion of mining corporations' facilities imposes substantial barriers to the contextualization and systematization of sustainability evaluations and communications. These barriers can be overcome with additional indicator systems and partnerships, but standard-setters, industry associations, and governments do not seem motivated to take up this challenge soon. This situation opens opportunities for individual mining corporations to enhance their particular approaches. This thesis provides important information that should be considered in the development of a much needed long-term strategy for stronger sustainability reporting in the sector.

**Key words:** Sustainability Reporting; Mining Sustainability; Sustainability Assessment; Corporate Accountability; Corporate Sustainability; Minerals; Mining; Social Responsibility; Systems Theories; Sustainability Indicators; Canada.

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The only way of finding the limits of the possible  
is by going beyond them into the impossible.

**Arthur C. Clarke**  
(The Lost Worlds of 2001)

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## List of Abbreviations

AA1000AS	Accountability 1000 Assurance Standard
BellagioSTAMP	Bellagio Sustainability Assessment and Measurement Principles
CBD	Convention on Biological Diversity
CERES	The Coalition for Environmentally Responsible Economies
CEO	Corporate Executive Officer
CS	Corporate Sustainability
CSR	Corporate Social Responsibility
DJSI	Dow Jones Sustainability Indexes
E3 PLUS	Environmental Excellence in Exploration Framework (Version 2)
EF	Ecological Footprint
EIA	Environmental Impact Assessment
EITI	Extractives Industries Transparency Initiative
EPI	Environmental Performance Index
GEO4	Global Environment Outlook (fourth version)
GHG	Greenhouse Gases
GMI	Global Mining Initiative
GRI	Global Reporting Initiative
GRI G2	Global Reporting Initiative Framework (Version 2)
GRI G3	Global Reporting Initiative Framework (Version 3)
GRI MMSS	GRI Mining and Metals Sector Supplement
HDI	Human Development Index
ICMM	International Council on Mining and Metals
ICMM SDF	ICMM Sustainable Development Framework
IISD	International Institute for Sustainable Development
ILO	International Labour Organization
IRMA	Initiative for Responsible Mining Assurance
ISAE 3000	International Standard on Assurance Engagements 3000
LCA	Life Cycle Assessment
LCC	Life Cycle Cost Analysis

LCSA	Life Cycle Sustainability Assessment
MAC	Mining Association of Canada
MAC TSM	MAC Towards Sustainable Mining Framework
MCA	Minerals Council of Australia
MFA	Mass Flow Assessment
NFR	Non-financial Reporting
MMSD	Mining Minerals and Sustainable Development
MNC	Multinational Corporations
NGO	Nongovernmental Organization
OECD	Organization for Economic Co-operation and Development
PDAC	Prospectors and Developers Association of Canada
PPP	Policies, Plans and Programmes
PROSA	Product Sustainability Assessment
RMG	Raw Materials Group
SEA	Strategic Environmental Assessment
SIA	Sustainability Impact Assessment
SSCM	Sustainable Supply Chain Management
TBL	Triple Bottom Line
TNC	Transnational Corporations
TNSF	The Natural Step Framework
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
WBCSD	World Business Council for Sustainable Development
WMI	Whitehorse Mining Initiative

# Chapter 1 Introduction

## 1.1 Background and Purpose Statement

It is a challenging task to assess contributions of mining corporations to sustainability<sup>1</sup>. The geographical dispersion of mining corporations' operations and the non-renewable nature of their products impose several difficulties. While the latter have long been addressed in academic debates, the former is rarely discussed. Studies have primarily focused on the problem of assessing sustainability of mineral projects, regions or global mineral commodities. Mining corporations have also been addressed in these studies, but not as the centre of analysis.

Mining corporations have complex interactions with the environment. These enterprises operate in various countries, ship their lasting products across the globe and buy energy and materials from different regions. Assessing their contributions to sustainability requires an evaluation of information drawn from different ecosystems, biomes, communities, cultures, and regulatory regimes. In the corporate context, the challenge of sustainability is not simply to set visions and evaluate social, environmental and economic indicators, but rather to assess a variety of indicators within and across complex socio-ecological systems situated in different geographical locations and scales.

Despite all complications, pressures are mounting for the provision of corporate sustainability accounts. Investors, financial institutions, non-governmental organizations (NGOs) and other stakeholder groups want to know if, and to what extent, mining corporations are contributing to sustainability. But mining companies seldom look for answers to these questions in the fields of ecological economics or natural resources management, which have long been addressing the challenge of assessing sustainability. It is the growing areas of corporate social

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<sup>1</sup> The differences between the terms “sustainable development” and “sustainability” are occasionally discussed in the literature. A few authors, like Ronnie Harding (1998, p. 18), are of the position that there is a distinction between both: “‘Sustainability’ refers to the goal and ‘sustainable development’ is the path or framework to achieve it.” Most scholars use the terms interchangeably (Hargroves & Smith, 2005, p. 45). Accordingly, “sustainability” and “sustainable development” are treated as synonymous in this thesis.



responsibility (CSR) and accountability that have been underpinning the first fragile and ill-conceptualized responses.

Mining corporations, in line with a global management trend (KPMG, 2008, p. 34), are increasingly publishing sustainability reports. In 2006, 40 out of the world's 44 largest mining companies published such documents (KPMG, 2006b). Sustainability reporting is now the norm among large mining companies (Deloitte, 2007). In spite of this quantitative progress, it has been claimed that sustainability reporting is neither fulfilling stakeholder's expectations of sustainability accountability nor acting as a catalyst for organizational behavioural changes towards sustainable development (Milne & Gray, 2007). According to some scholars, it could even be camouflaging corporate un-sustainability (Moneva, et al., 2006).

Despite the growing use of the term "sustainability" to describe such disclosures (CorporateRegister.com, 2008b), companies have been overlooking fundamental tenets of the sustainable development concept, such as integration of social-ecological issues, long-term timeframes, equity, and precaution (Bebbington, 2001; Byrch, et al., 2007; Gray, 2005; Gray & Bebbington, 2007; Gray & Milne, 2002; Gray & Milne, 2005; Laine, 2005; Milne, Ball, et al., 2005; Milne, et al., 2006; Milne, et al., 2009). A key issue in this debate is that the current sustainability reports published by corporations have been based on reporting frameworks that focus on internal organizational performance, viewing sustainability as synonymous with Corporate Social Responsibility. If companies want to avoid criticism and effectively understand and report their long-term contributions to society and the environment, significant changes in their approaches to assessing and communicating sustainability will be necessary.

There has been some academic scepticism about the possibility of creating meaningful corporate sustainability reports (Buhr, 2007), i.e. reports that can provide information on whether the reporting organization is contributing or not to sustainability. Nonetheless, there has also been a growing call for the promotion of more robust conceptualizations of sustainability in the corporate reporting process (Beloff, et al., 2004; Gray, 2010; Gray & Bebbington, 2007; Hawken, et al., 1999; Henriques & Richardson, 2004; Lenzen, et al., 2004; McElroy, et al., 2008; Milne, et al., 2009; Moneva, et al., 2006; Parker, 2005). The underlying

argument of such calls is that corporations need more sophisticated and integrative frameworks to assess and report contributions to sustainability. Few studies, however, have explored ways to bring about this change. The purpose of this thesis is to address this challenge.

## 1.2 Research Question and Objectives

This thesis seeks to understand how to strengthen mining corporations’ disclosures of sustainability performance. More specifically, it sets out to answer the following questions:

**What needs to be changed in mining corporations’ approaches to assessing and reporting sustainability for the purpose of promoting more meaningful and reliable disclosures?**

**What are the key practical and conceptual barriers to implementing those changes?** To answer these questions, the research has set up the general and specific objectives presented in Table 1-1.

**Table 1-1 - General and Specific Objectives**

General Objectives	Specific Objectives
1. Identify the key changes that should be implemented in mining corporations’ sustainability frameworks to promote more meaningful and reliable disclosures	1.1 Describe the historical roots and insights of concepts such as sustainable development, corporate social responsibility, corporate sustainability, and sustainability reporting
	1.2 Describe the main institutional and political reactions to the sustainability imperative, highlighting the corporate perspective
	1.3 Describe the mining sector, its history, actors and institutions
	1.4 Understand how sustainable development has been incorporated into mineral policies as well as in the fabric of mining corporations
	1.5 Describe the key sustainable mining initiatives, including corporate reporting practices
	1.6 Identify the key challenges involved in the operationalization of sustainability notably in the context of large transnational mining corporations
	1.7 Review the key theories, approaches, and methods being used to report and assess sustainability
	1.8 Identify the requirements of an effective corporate sustainability assessment and reporting frameworks
	1.9 Analyze the extent to which the current reporting frameworks being used by mining corporations meet the requirements of objective 1.8
	1.10 Propose specific changes in the predominant framework being used by mining corporations that may lead to more effective and reliable disclosures of sustainability performance

2. Understand the practical and conceptual barriers to implementing the changes proposed in objective 1.10

2.1 Understand the perception of mining stakeholders on the limitations of current sustainability frameworks

2.2 Analyse the strengths and weaknesses of the initiatives that the mining industry is taking to enhance sustainability reporting (standardization and assurance)

2.3 Identify and discuss the implications of key barriers to implement the changes proposed in objective 1.10

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### **1.3 Justification**

This thesis addresses research needs primarily in three academic fields: corporate social and environmental accountability, sustainability assessment, and mineral policy. The main tenets of current corporate sustainability reporting practices stemmed from works related to corporate social and environmental accountability, which deal with the increasing need that businesses face to disclose non-financial information. In spite of its rapid development, this field is still in formative stages, facing several gaps and problems such as the inappropriate conceptualization of sustainability (Gray & Bebbington, 2007; Spence & Gray, 2007). One of the most comprehensive reviews of the research landscape related to corporate socio-environmental accountability argued that it needed more normative studies and “cross-disciplinary explorations into the environmental management, environmental law and environmental economics literatures” (Parker, 2005, p. 856). This thesis presents such a normative, cross-disciplinary exploration.

The field of sustainability assessment, which can be seen as a part of the broader field of natural resources and ecological management, seeks to understand the temporal interactions of humans with the environment. A variety of purposes and methods can be used in the study of this interaction. It can include the development of indicators and frameworks to be applied in national policies, impact assessments, and regional development programs. Numerous studies have been undertaken in this field, but the vast majority have concentrated in the perspectives of geographical areas or systems, such as projects, national territories, ecosystems, or the biosphere as a whole. This thesis contributes to this field, while generating knowledge on how

a sustainability framework can be applied in the context of geographically dispersed transnational mining corporations.

The research will also be addressing the specific academic needs of decision-makers, public and private, in the area of mineral policy. The behaviour of large mining companies has long been challenged as unsustainable. In reaction to mining-triggered problems like community disruption, loss of biodiversity, toxic floods, among others, dozens of international initiatives have been created to improve the social and environmental performance of this sector. These initiatives are stemming not only from consolidated international organizations, such as the World Bank Group and UNEP, which have been broadening their agenda to encompass mining issues, but also from civil society groups, research organizations and, increasingly, from the industry itself.

A key research issue for many of these initiatives is how best to establish sustainable mining assessment and reporting frameworks, i.e. tools that allow policy-makers, managers and other mining stakeholders to understand how well companies are progressing towards sustainability. Mining industry associations, such as the International Council on Mining and Metals (ICMM) and the Mining Association of Canada (MAC), are currently promoting such a framework among their members. Yet, to date, in most scholars' inquiries about the outcomes of initiatives like these attention is given to data description, quality of reports, and identification of trends (Guenther, et al., 2006; Jenkins, 2004; Jenkins & Yakovleva, 2006; Matthews, et al., 2004; Mudd, 2007a, 2007b; Peck & Sinding, 2003; Robertson & Jack, 2006; Sanchez, 2008). Very few scholars are questioning the effectiveness of reporting frameworks, let alone exploring better ways to frame corporate contributions to sustainability, as this thesis sets out to do.

This thesis can potentially offer significant practical contributions, as it explores ways to positively influence the behaviour of powerful and influential organizations. Although representing just a small fraction of the world's total number, the largest 25 mining companies produce more than 40% of the global metal production (UNCTAD, 2007, p. 109). Moreover, large transnational corporations (TNCs) are the main organizations that have been embracing sustainability reporting (Palenberg, et al., 2006). TNCs have become very relevant actors in the

world's economic and environmental affairs (Dicken, 2007, pp. 106-136). In 2006, the world's top 100 TNCs owned more than 9 trillion dollars in assets and directly employed more than 15 million people worldwide (UNCTAD, 2008, p. 27). The practices of these organizations usually dictate the managerial "fashion" to thousands of medium and small-size companies. Influencing the frameworks with which large mining corporations (and TNCs in general) evaluates and communicate sustainability performance can work as a leverage point to increase sustainable practices in the business sector.

Many authors have proposed sustainability frameworks to be used by businesses (Atkinson, 2000; Azapagic, 2003; Baumgartner, 2006; Fowler & Hope, 2007; Hediger, 2007; Pojasek, 2007). Nonetheless, very few studies have drawn on the latest developments in the several theoretical strands of sustainability assessment from the ecological sciences to create corporate sustainability reporting frameworks. Furthermore, few studies have addressed the barriers to implementing such innovations. By exploring these new research avenues, this thesis provides a more robust and practical sense of if and how a more effective sustainability reporting framework can be adopted by corporations.

As the next chapter explains, sustainability reporting (and its problems) is not restricted to the mining sector. Banks, transportation companies, pharmaceutical and high tech industries, among many others, are reporting sustainability in a similar fashion to mining companies. Nonetheless, by restricting the analysis to the mining perspective, the research obtained a more in-depth understanding from interviewees of the context (organizational, procedural, behavioural, geographical, etc.) in which sustainability reporting takes place and evolves. Moreover, the mining sector has a number of characteristics that suits it for a thorough investigation:

*Sustainability accountability is a strong and genuine imperative for mining corporations.*

Mining operations can only be sustained so long as the extraction of finite mineral bodies remains technically and economically feasible. This distinguishing aspect of mining has frequently led to allegations that the industry "is inherently unsustainable" and that a "truly sustainable global society will take fewer minerals from the earth each year (...)" (Young and

Septoff, 2002, p. 1). Mining companies have long been involved in many human rights violations, corruption scandals, and tailings dam accidents, which triggered the emergence of anti-mining groups questioning that sector's ability to behave sustainably. In this context, sustainability accountability has become a genuine imperative for the sector.

*The sector has a rich history of sustainability reporting.* Mining companies have been among the most active corporate sustainability reporters (CorporateRegister, 2009; KPMG, 2008). Several mining and metal commodity associations are currently fostering sustainability reporting among their members. Many of these initiatives have been addressed in previous studies, thus generating published material to support the proposed research. Given the numerous companies, organizations, and scholars interested in the reporting phenomenon among mining companies, the chances of identifying knowledgeable interviewees are in the mining sector.

*Author has applied knowledge of the mineral sector.* The research was undertaken by a former social and environmental auditor of a transnational mining corporation. In his professional experience, he travelled to many mining sites, thus gaining knowledge of the challenges involved in mining sustainability not only as described in the literature, but also as seen “on the ground”. This knowledge has facilitated the analysis of the literature and the identification of relevant interviewees.

The findings of this thesis can be useful to institutions and individuals concerned about the impacts of corporations on social and ecological systems. These include, among others, corporate directors and managers, international organizations, NGOs, local communities, and industry organizations. Given the study's focus on the reporting practices of transnational mining corporations, the stakeholders of this sector are likely to benefit more than others. Table 1-2 exemplifies some of the specific audiences that can benefit from this study. Increasingly governments are becoming interested in corporate sustainability reporting. Several jurisdictions have made it mandatory, and many others are promoting it as a voluntary practice (UNEP and KPMG, 2006). A notable example of the latter is Canada's *Corporate Social Responsibility Strategy for the Canadian International Extractive Sector* (DFAIT, 2009).

Initiatives like these show that public policy-makers interested in bringing about effective ways to regulate or promote sustainability reporting will also benefit from this thesis.

**Table 1-2 - Potential Non-governmental Audience of the Proposed Research**

<b>National Mining and Commodity Associations</b>	<b>NGOs and research institutions</b>	<b>Mining Companies</b>	<b>International Organizations</b>
International Council on Mining and Metals	Friends of the Earth	AngloAmerican	Global Reporting Initiative
Mining Association of Canada	Mineral Policy Institute	AngloGold Ashanti	AccountAbility
Minerals Council of Australia	MiningWatch Canada	Barrick	UNEP
Brazilian Mining Association	Corporate Europe Observatory	BHP Billiton	IISD
International Aluminum Institute	Earthworks	Freeport-McMoran	World Bank
World Coal Institute	Mining, Minerals and People	Lonmin	International Finance Corporation
World Gold Council	Down to Earth	Newmont	ILO
	Global Witness	Rio Tinto	
	Oxfam America	Teck	
		Vale	
		Xstrata	

The results can also be important to many scholars interested in corporate accountability, business ethics, sustainability assessment, and mineral policy. The audience of the following professional and academic journals are among those who should profit from this study: *Accounting, Auditing & Accountability Journal; Business Strategy and the Environment; CIM Bulletin; Canadian Mining Journal; Corporate Environmental Strategy; Corporate Social Responsibility and Environmental Management; Environmental Management; Ecological Economics; Environmental Management; International Journal of Sustainable Development; Journal of Business Ethics; Journal of Cleaner Production; The Journal of Corporate Citizenship; Journal of Environmental Assessment Policy and Management; and Natural Resources Forum; Resources Policy.*

#### **1.4 Thesis Outline**

This thesis is structured in seven chapters, two of which were drawn from previous papers that were published in peer-reviewed journals or conference reports (Fonseca, 2008, 2010a, 2010b).

Chapter Two explains and justifies the research methodology. The initial sections introduce the conceptual and theoretical framework, its main elements and assumptions. The chapter then discusses the grounded theory approach used in the research. All the data collection and analysis techniques are carefully described. These include literature reviews, semi-structured interviews, content analyses, coding, memo-writing, and diagramming. The criteria used to select the sample of interviewees, literature, and documents are also justified. The last sections finally disclose the limitations of the employed methodology and draw some ethical considerations.

Chapter Three provides a critical background on corporate sustainability accountability in the mineral sector. The history and definitions of key concepts and theories are critically reviewed (e.g. sustainability, accountability, stakeholder theory, corporate social responsibility, and mining sustainability). The chapter then discusses the role of key players in the mining sector and emphasizes the growing relevance of mining and metal corporations' initiatives. This chapter sets the ground for the following ones while highlighting the need to further investigate mining corporations' growing disclosures of sustainability performance.

Chapter Four answers the main research question, while identifying what needs to be enhanced in mining corporations' sustainability reporting frameworks. It starts by describing, comparing, and exemplifying several approaches to designing sustainability assessment and reporting frameworks. The strengths and weaknesses of these approaches are discussed and the need to observe a number of principles is emphasized. Section 4.4 then evaluates the extent to which sustainability reporting, as proposed and practiced by mining companies, meets each of those principles. Chapter Four finally presents the changes that need to be implemented in the reporting frameworks being used by mining corporations for the purpose of promoting more reliable and meaningful disclosures of sustainability performance.

Chapter Five addresses a recent industry initiative that is directed at trying to promote more reliable sustainability reports among mining corporations: the ICMM Assurance Procedure. This chapter undertakes a detailed analysis of the extent to which that procedure can contribute to increased trust in mining companies' sustainability reports. Chapter Five begins to answer



research objectives two (identify the barriers to enhancing sustainability reporting) while noting the difficulties that already exist in the current practice. The final sections highlight the limitations of standardized external assurance and call for a better understanding of the many ways to enhance sustainability reporting.

Chapter Six elaborates on the second objective while discussing the challenges involved in the implementation of the most relevant reporting requirements proposed in Chapter Four.

Drawing substantially on primary data, this chapter discusses the many barriers that may hinder the implementation of more meaningful and reliable sustainability disclosures in the mining sector. These barriers are arranged according to motivational, structural, and specific categories, with due consideration for their relationships and relevance. Finally, the most promising strategies for overcoming those barriers are suggested.

Chapter Seven summarizes the findings and highlights academic contributions. It then specifies the main practical implications of the research for mining companies, standard-setters, mining associations and users of sustainability reports. The thesis concludes with directions for future research.

## Chapter 2 **Research Approach and Design**

### **2.1 Key Philosophical and Conceptual Assumptions**

This thesis has a key ontological assumption: that truth is relative and situational. Concepts, theories, quotations, analogies, descriptions, and diagrams are used in this research to help structure a vernacular system or metaphorical context (Lakoff & Johnsen, 2003) to communicate and advance contextual knowledge on a complicated scholarly debate on corporate sustainability and accountability in the mining sector. The fabrication of the arguments presented here does not seek to convey a universal knowledge, but a pragmatic one that emerges from the comparative analysis of different points of view. The underlying goal is to help reporting practitioners, policy-makers, standard-setters, among other actors, promote more meaningful communications of mining corporations' role in sustaining socio-ecological systems.

In line with some philosophical schools of pragmatism, this thesis was driven more by “anticipated consequences” than by antecedent phenomena (Cherryllhomes, 1992). The potential benefits of enhancing sustainability reporting were a key motif for defining the “what and how” of this thesis. These potential benefits were recognized by the author during his professional experience in a large mining corporation. Accordingly, researcher and subject matter are inevitably linked in this thesis. The researcher was once an “insider” of sustainability reporting, insofar as he had the opportunity to witness this practice's many challenges, such as mapping stakeholders, defining corporate responsibilities, and creating information systems, amongst others. While beneficial in several ways, the researcher's previous involvement in this practice may have contributed to biases. His interpretation of the literature and interviews, for example, may reflect to a certain extent some of the values and perceptions of reporting practitioners. The author attempted to distance himself from the subject matter, however, as the value of his conclusions and recommendations depended on a reasonable understanding of the problem as seen by different actors. The rhetorical device of using third-person speech in this document reflects his effort.

This thesis, like much of social science, relies on conceptual assumptions, most of which are disclosed in the following chapters. Among the most important is the concept of “corporate sustainability”, which, although seen through pluralistic lenses here, is assumed to differ from “corporate social responsibility”, in that the former tends to expand business ethics to include the desired state of ecological systems.

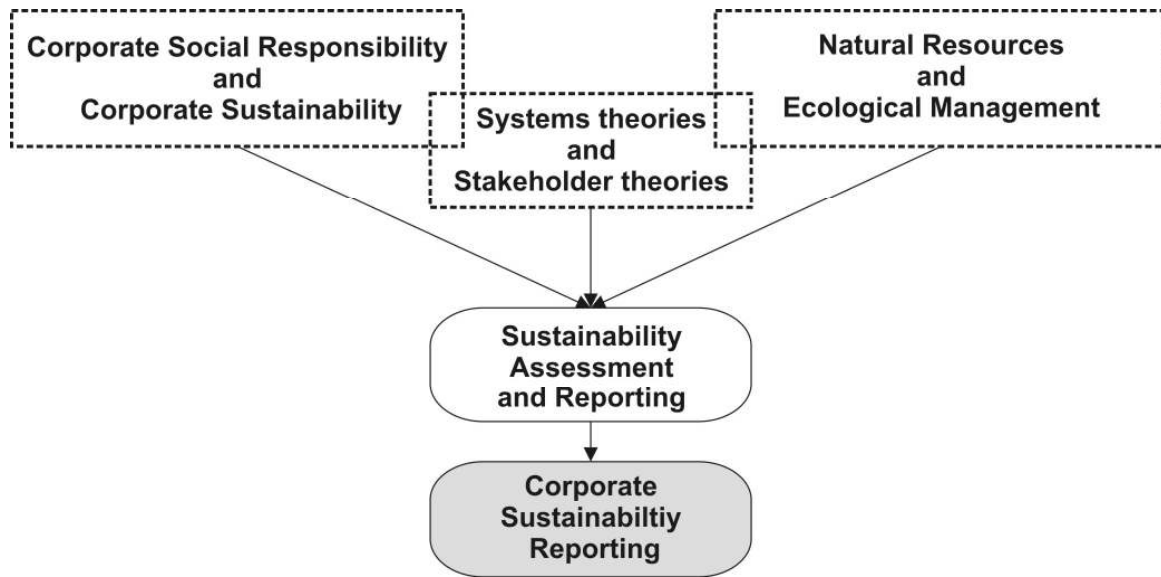
## 2.2 Conceptual-Theoretical Framework

This research draws on several concepts and theories<sup>2</sup> in connection with the social and ecological sciences. Such a pluralistic approach is seen by many as appropriate, if not *sine qua non*, to tackle interdisciplinary phenomena (Bohman, 1999; Griffiths, 1997; McIntosh, 1987). Parker (2005) noticed that many previous studies on sustainability reporting have drawn on theoretical pluralism. Most of these reports, however, emphasized social science theories. The proposed research will also encompass literature drawn from ecological sciences. Such a scope is required in order to address the evident weaknesses of current models of sustainability reporting.

The conceptual-theoretical framework (Figure 2-1) mixes the “boxes” of CSR, Natural Resource Management, systems and stakeholder theories. As discussed in the following chapters, the role of these concepts and theories is to help identify a stronger approach for corporate sustainability reporting. It is important to note that several other theories could have been used here. After all, “[n]o theory, or theoretical framework, provides a perfect explanation of what is being studied (Given, 2008, p. 871)”. Nonetheless, the ones highlighted in Figure 2-1 are believed to be among the most relevant to answer the objectives.

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<sup>2</sup> The term theory is contested, as it has been used in many ways to refer to a variety of textual statements and mathematical principles that seek to explain, describe, predict, classify, or prescribe phenomena (Horkheimer, 1975; Layder, 2006; Norberg & Cumming, 2008; J. D. Smith, 2009). This thesis uses the term broadly as set of largely supported statements that try to explain phenomena, but not necessarily in a way that the explanation is general, falsifiable, verifiable, reproducible, or possess other characteristics prescribed by some schools of thought (Maxwell & Mittapalli, 2008). Whenever possible, this thesis will qualify the cited theory as “normative”, “explanatory”, etc.



**Figure 2-1 - Conceptual/Theoretical Framework**

“Many complex or practical problems can only be understood by pulling together insights and methodologies from a variety of disciplines.” (Nissani, 1997, p. 39) This research draws on the literature on natural resources and ecological management with corporate sustainability and accountability in order to investigate the possibility of creating meaningful corporate sustainability reports, that is, information that can effectively inform stakeholders and decision-makers about the short-term and long-term interactions of organizations with society and the environment. Although this kind of exploration is not new, very few studies have elaborated on its implications for the design of corporate sustainability reporting frameworks, let alone identify barriers to their subsequent implementation.

## **2.3 Methodology**

### *2.3.1 A Qualitative and Grounded Approach*

Many methods, from positivist statistical tests of hypotheses to inductive explanations of phenomena, were considered during the design of this research. Qualitative and quantitative approaches were not seen as polarized, but rather as complementary (Bavelas, 1995).

Nevertheless, the research problem had several characteristics that called for a predominantly qualitative investigation. Among the most important characteristics are the ones delineated by Bruce Berg (2001b, pp. 10-11); that is, the existence of subjective, contextual, and unknown data hindering meaningful statistical or mathematical analysis.

Sustainability reporting is an accountability tool being used by an unknown number of mining companies and people across dozens of countries. Meeting requirements for representativeness and sufficiency of sample size to allow meaningful statistical results would demand either very narrow research questions or more time and financial resources. Given the scarcity of studies in connection with the research problem, the author deemed a general qualitative exploration of the topic to be a more insightful and productive choice. In addition, the practice of sustainability reporting encompasses a variety of intricate concepts whose meanings are not consistently understood by the many actors involved in it. In this context, the use of quantitative survey techniques would run the risk of yielding misleading results and of missing subtle and subjective nuances in individuals' perceptions. As Ian Dey (1993, p. 29) explains, "the more stable and fixed the meanings we can assign to data, the more we can use with confidence the elegance and power of mathematics. The more ambiguous and elastic our concepts, the less possible it is to quantify our data in a meaningful way."

Qualitative research has a long history. Researchers have been using qualitative methods as far back as the 17<sup>th</sup> century (Lockyer, 2008). The assumptions, tenets, and techniques used in these studies have varied significantly depending on the discipline and time period. For example, Norman Denzin and Yvonna Lincoln, in the widely cited *Handbook of Qualitative Research* (2005), distinguished seven moments of qualitative research only in the 20th century. In light of the evolving and multifaceted nature of qualitative research, its meaning and definition can vary substantially. This thesis' methodology is not in line with every strain of qualitative research, but with the recent interpretation of John Creswell, who sees qualitative research as the result of a contextual-inductive reasoning based on multiple sources of data:

*Qualitative research begins with assumptions, a worldview, the possible use of a theoretical lens, and the study of research problems inquiring into the meaning individuals or groups ascribe to a social or human problem. To study this problem,*

*qualitative researchers use an emerging qualitative approach to inquiry, the collection of data in a natural setting sensitive to the people and places under study, and data analysis that is inductive and establishes patterns or themes. The final written report or presentation includes the voices of participants, the reflexivity of the researcher, and a complex description and interpretation of the problem, and it extends the literature or signals a call for action. (Creswell, 2007, p. 31)*

Creswell noted that the many types of qualitative research share a set of common characteristics, such as multiple sources of data, inductive analysis, interpretative inquiry, and a holistic account of the problem, that is, a complex account of the multiple perspectives of the problem with regards to the bigger picture in which it is situated. Moreover, qualitative researchers frequently use a particular theoretical lens in their analysis. As the next chapter will show, this has often been the case in studies on sustainability reporting. Many authors have employed the lenses of legitimacy or stakeholder theories to explain the reporting phenomenon. In this thesis, the requirements for, and barriers to, strengthening sustainability reporting are not explored through a particular lens, but rather through a number of theories and concepts from both ecological and social sciences. As previously mentioned, this plurality of references is believed to provide a more insightful and rich context to explore the problem.

Although sharing several characteristics, qualitative research can be undertaken through many approaches or strategies. Among the most common are case study, ethnography, grounded theory, clinical and narrative research (Denzin & Lincoln, 2005). These approaches have, in turn, several sub-approaches. Narrative research, for example, includes biographical and oral history studies. Furthermore, qualitative approaches are not necessarily used in their “pure” form. Authors often use two or more strategies of inquiry in a single study.

This thesis followed a grounded theory approach, which is particularly useful in the absence of largely tested theories to explain the studied social phenomenon (Creswell, 2007, p. 66). The requirements of, and barriers to, meaningful sustainability reporting in the mining sector is a relatively under-researched problem. No significant theory or model is currently available to fully answer the research questions outlined in Table 1-1.

The publication of the Grounded Theory method in 1967 (Glaser & Strauss, 1967) re-opened methodological doors for social scientists who see sense in generating induced explanations from qualitative data, rather than in deduct explanations through tests of hypothesis. Grounded theory's main tenet – that explanations or theories are “grounded” in data or in the views of participants – has enticed numerous scholars, to the point that, in 1994, Norman Denzin stated that “the grounded theory perspective is the most widely used qualitative interpretive framework in the social sciences today” (Denzin, 1994, p. 508). There have been, however, many debates surrounding the validity, merits, and problems of grounded theory. Today, the “classic” method of Glaser and Strauss is one among three versions (Charmaz, 2006; Corbin & Strauss, 2008; Mills, et al., 2006). Even though Glaser contends that scholars have been misusing and misnaming his original method (Glaser, 2002, 2009), new variants are being increasingly adopted and discussed (Locke, 2001; Mills, et al., 2006).

This thesis, to a great extent, has followed the recent “constructivist” variant of grounded theory (Charmaz, 2005, 2006), which has significant epistemological differences from Glaser and Strauss's original work. The constructivist version shares the key procedural aspects of the original method. However, it interprets the “analyses in the specific historical, social, and interactional conditions of their production, rather than constructing concepts abstracted and separated from their origins” (Charmaz & Bryant, 2008). The constructivist version is in line with the philosophical assumptions outlined above in Section 2.1, as it seeks to understand a social phenomenon as situated knowledge, rather than “truth”.

The requirements for, and barriers to, strengthening sustainability reporting in the mining sector include factors of various natures (e.g. institutional, behavioural, political, procedural, cultural, etc.), which can be differently valued and interpreted by people. Because of this complexity, this study did not aim at reaching an overall explanation, but simply at capturing a certain degree of situated knowledge. For this purpose, the thesis followed most of Charmaz's (2006) suggested procedures: data collection, coding, memo-writing, iterative analysis, and diagramming.

### 2.3.2 Data Collection Methods

A variety of data collection methods can be used in grounded theory and in qualitative research in general. As Linda Kalof and others have noted, “[w]hen deciding what method to use, there is no right or wrong answer, but some methods will be better choices than others for particular research topics. Several factors determine the ‘best’ data collection strategy for a topic.”

(Kalof, et al., 2008, p. 103) Among the factors considered during the design of this thesis were the nature of the research strategy, existence of published material, accessibility of data, geographical dispersion of mining companies, research audience, time and financial resources.

Three traditional data collection methods were deemed appropriate to answer the research questions: literature reviews, content analysis, and semi-structured interviews. These methods were used to either generate new data or triangulate data sources. This triangulation did not underpin each research objective; the purpose was simply to corroborate specific arguments. All data collection methods used purposive or purposeful samples. The literature reviewed, the data analysed, and the people interviewed were selected because they could “purposefully inform an understanding of the research problem and central phenomenon in the study” (Creswell, 2007, p. 125). No consideration to statistical representativeness was given during this process.

#### 2.3.2.1 Literature Reviews

A literature review has been defined as...

*the selection of available documents (both published and unpublished) on the topic, which contain information, ideas, data, and evidence written from a particular standpoint to fulfil certain aims or express certain views on the nature of the topic and how it is to be investigated, and the effective evaluation of these documents in relation to the research being proposed (C. Hart, 1998, p. 13)*



In light of the many types of literature usually needed to be reviewed in qualitative research, Richard Race argued that “the concept of literature review is very much a plural rather than a singular one.” (2008, p. 487) This argument is particularly valid here, as several literature reviews were necessary in the research. The goals of these reviews were diverse. For instance, literature reviews helped to contextualize and justify the thesis, as well as to corroborate the selection of the methods and research strategies. Yet the most relevant role of the literature reviews was to help identify the requirements of a more effective sustainability reporting framework for global mining corporations, and, thus, help answer research question one.

Literature reviews were deemed appropriate for this last purpose because data on the requirements of corporate sustainability reporting frameworks from a social-ecological systems perspective have been published, but not yet articulated in a robust and coherent body of academic work. These data were scattered across numerous academic and non-academic publications from many disciplines. Literature reviews provided an ideal way to collect this knowledge and help identify overlaps, gaps, and conflicts. According to the taxonomy of literature reviews outlined by Harris M. Cooper (1988), this type of literature review can be described as an “integrative” one. As such, it needs to observe a number of scientific guidelines (Cooper, 1982), such as the consideration of reliable sources.

This thesis, although acknowledging that “all [literature] reviews are partial in some way or another” (C. Hart, 1998, p. 25), strove to be attentive to a plurality of sources and perspectives. The sample of literature was not only purposive but also theory-guided (Palys, 2008), in the sense that it reflected the aforementioned conceptual and theoretical framework. Hundreds of publications from academia, industry and NGOs sources were cited in this thesis. Searches for literature covered books; professional and academic journals; conference proceedings; industry and NGO reports; websites; and other types of grey literature in connection with the research’s topic. The research portal Scopus was used to keep track of the flow of publications in connection with the topics and authors deemed relevant to this thesis.

### 2.3.2.2 Semi-structured Interviews

The semi-structured interview has been defined in many ways. This thesis' approach to this method reflects the interpretation of Lioness Ayres, who defined it as a data collection where:

*the researcher asks informants a series of predetermined but open-ended questions. The researcher has more control over the topics of the interview than in unstructured interviews, but in contrast to structured interviews or questionnaires that use closed questions, there is no fixed range of responses to each question (L. Ayres, 2008, p. 810)*

Some scholars of methodology have noted that “researchers often build interviews into a research design almost automatically (...)” and that “(...) inexperienced researchers feel that it is somehow easier and more natural to embark on a semi-structured interview programme than, for instance, to conduct and analyse a survey” (Bechhofer & Paterson, 2000, pp. 51-52). This has not been the case here. The choice of interviews was carefully considered. The questions that this thesis tries to answer demanded a variety of data that could not be captured in published material. While requirements for sustainability reporting have been examined by some researchers, the barriers to enhancing reporting in the mining sector have been largely unexplored. Interviews played therefore a key role in capturing the perception of barriers from those involved in sustainability reporting in the mining sector. Interviews were also very important to expand, and corroborate the value of, some reporting requirements highlighted in the literature.

The choice of semi-structured interviews was also carefully considered. Semi-structured interviews are recommended for use in “the exploration of more complex and subtle phenomena. If the researcher wants to collect information on simple and uncontroversial facts, then questionnaires might prove to be a more cost-effective method.” (Denscombe, 2007, p. 174) As mentioned earlier, the field of sustainability reporting is filled with concepts that can mean different things to different people. In such contexts, a structured, rigid set of questions surrounding reporting could run the risk of yielding unreliable results. More flexible, open-ended questions are fundamental to ensure a common understanding of the object of inquiry.

Too open-ended a question may impair comparisons among answers. Colin Robson (2002, p. 270) has also noted that semi-structured interviews “lend themselves well in combination with other methods”. This thesis has pursued this type of multi-method approach. The semi-structured interviewees were used in combination with literature reviews and document analysis, thus meeting to a certain extent Denzin’s (1978) call for *methodological* triangulation. One could argue that *data sample* triangulations also took place within the interviews, as key informants were drawn from a plurality of perspectives and background.

The data were collected through 41 confidential interviews of about one hour between August and December 2009. The main criterion used in the selection of the non-probabilistic, purposive sample of interviewees was to capture a diversity of views from people who use, train, research, promote, and provide services in connection with sustainability assessment and reporting (notably in the mining sector) in various countries, such as Canada, United States, Australia, South Africa, India, United Kingdom, and Brazil. Table 2-1 summarizes the profile and reference codes of the groups of interviewees. Several interviewees had not been identified by the time the research was proposed. Their inclusion in the research was suggested by other interviewees, following a snowball sampling logic.

**Table 2-1 - Interviewees’ Profiles and Codes**

<b>Group</b>	<b>Interviewee Profile</b>	<b>Quantity</b>	<b>Code</b>
GRI <sup>3</sup> -certified consultancies	Experienced GRI-certified sustainability reporting trainers	5	CC
International Consultancy	Experienced consultants on corporate sustainability tools and strategies, including sustainability reporting.	6	CI
Research Centres and Departments	Researchers (all PhD holders) with significant knowledge on sustainability assessment and reporting.	5	RD
Mining Industry Practitioners	Managers and Directors of Corporate Responsibility or Sustainability who oversee, hire and/or coordinates sustainability reporting in large mining companies.	6	MP
Mining NGO Representatives	Senior NGO employee with relevant activism experience in the mining and metals sector.	4	MN
Mining Sustainability	Scholars and consultants with large experience in mining	9	ME

<sup>3</sup> GRI stands for Global Reporting Initiative, a very influential not-for-profit organization in the realm of sustainability reporting that will further discussed in the thesis.

Experts	sustainability issues, including assessment and reporting.		
Mining Association Managers	Directors or presidents of mining associations that are promoting sustainability reporting.	4	MA
Reporting Organizations	Senior staff involved in the design and promotion of sustainability reporting.	2	RO

Seven main criteria were used to select interviewees that could help to answer the research questions. The key informants were expected to

- hold or have held senior position in notable international organizations and associations in connection with the promotion of sustainability<sup>4</sup>;
- be either Director or Manager of Corporate Responsibility or Sustainability and is responsible for sustainability reporting at large global mining companies;
- be a senior employee of NGOs targeting sustainability issues in the mining sector;
- be either president or director of mining or metal commodity organizations and associations who are directly involved in the promotion of sustainability reporting among member companies<sup>5</sup>;
- have published books or widely cited<sup>6</sup> articles in refereed international journals that directly address sustainability assessment and/or corporate sustainability accountability;
- be a GRI-certified<sup>7</sup> training consultant; or
- be a senior consultant in corporate sustainability assessment and reporting.

Given the relevance of the Global Reporting Initiative<sup>8</sup> (GRI) framework in current sustainability reporting practice, the sample was significantly oriented to capture the perception of those who deeply understand that framework. As a result, the interviewees included one of the co-founders of GRI, two members of GRI’s Stakeholder Council and Board of Directors,

<sup>4</sup> E.g. International Institute for Sustainable Development, [www.iisd.org](http://www.iisd.org) / Sustainability Institute, [www.sustainabilityinstitute.org](http://www.sustainabilityinstitute.org) / Redefining Progress, [www.rprogress.org](http://www.rprogress.org) / The Natural Step, [www.naturalstep.org](http://www.naturalstep.org) / Forum for the Future [www.forumforthefuture.org](http://www.forumforthefuture.org) / Research Institute for Managing Sustainability [www.sustainability.eu](http://www.sustainability.eu) / Global Reporting Initiative, [www.globalreporting.org](http://www.globalreporting.org) / International Sustainable Development Research Society (ISDRS), [www.isdrs.org](http://www.isdrs.org) / International Institute for Environment and Development (IIED), [www.iied.org](http://www.iied.org), Resilience Alliance, [www.resalliance.org](http://www.resalliance.org) / Ecologic Institute, <http://ecologic.eu>. All websites were retrieved on December 30, 2009.

<sup>5</sup> E.g. The International Council on Mining and Metals, [www.icmm.com](http://www.icmm.com) / Mining Association of Canada, [www.mining.ca](http://www.mining.ca) , Minerals Council of Australia, <http://www.minerals.org.au/enduringvalue>. All websites were retrieved on December 30, 2009.

<sup>6</sup> The Scopus research portal was used to assess the research production of the identified authors. Among the factors considered in the analysis was the authors’ “h-index”.

<sup>7</sup> The relevance of a GRI certification will become clear in Section 3.4.3.

<sup>8</sup> To be further explained in Section 3.4.3.

and seven people holding positions in organizations participating in GRI's Organizational Stakeholder group.

A flexible questionnaire, which can be seen in Appendix 2, was used to structure and compare the interviews. Before approaching the individuals, a few pilot interviews were undertaken to check the need for changes in the wording, focus, or order of questions. Appendix 2 reflects the enhanced questions that structured the interviews analysed for this thesis. Among the addressed topics are strengths and weaknesses of the GRI and Towards Sustainable Mining (TSM) frameworks; conflicts of terminology between corporate responsibility and sustainability; requirements of effective sustainability assessment and reporting; barriers to promoting and providing guidance on 1) contextualized sustainability performance, 2) the state of impacted socio-ecological systems, 3) cumulative effects, 4) facility-level performance, 5) integrated indicators, 6) credible, externally verified performance, and 7) meaningful and comparable stakeholder engagements.

The choice for telephone as opposed to face-to-face interviews is explained primarily by the geographical dispersion of interviewees. The audience was located in Europe, North America, Asia, Oceania, South America, and Africa. The research investigated a reporting mechanism with worldwide reach. Face-to-face interviews have several strengths, but, in the research's case, they would be economically unfeasible. However, in comparison with mailed surveys and other non-live methods, telephone interviews have several advantages, such as allowing for a deeper engagement with the interviewee, for corrections of misunderstandings, and for the identification of cues through the tone of voice (Gillham, 2005). An additional benefit of telephone interviews is that they can be easily audio-recorded.

### 2.3.2.3 Content Analysis

Content analysis is a somewhat difficult term in the methodology literature, as it has been used to describe techniques to both "collect" and "analyse" data (Berg, 2001a). Moreover, it is present in qualitative and quantitative studies, often under different terms (Neuendorf, 2002).

Heidi Julien defined it as “the intellectual process of categorizing qualitative textual data into clusters of similar entities, or conceptual categories, to identify consistent patterns and relationships between variables or themes” (Julien, 2008, p. 120). Similarly, Linda Kalof and others defined content analysis as “a technique used to analyse texts, whether written, spoken or visual (...)” whose main goal “(...) is to systematically classify words, phrases, sentences and other units of text into a series of meaningful categories” (Kalof, et al., 2008, p. 105).

It follows from these definitions that content analysis is somewhat embedded in other data collection methods, such as interviews and document reviews. Nevertheless, Kalof and others interpret content analysis as a method of data collection in itself, insofar as it allows for the generation of new data that were not explicit in the analysed material. This thesis also interprets content analysis as a method of data collection. Significant data or insights could only be collected through a systematic content analysis of the themes and patterns “grounded” in the literature, websites, reports, and interviewees’ responses. While the answers to all research questions were based to a certain extent on content analysis, some specific questions profited more than others. These included questions 2.2 and 2.3, which respectively addressed the value of standardized external assurance and the barriers to implementing the proposed framework.

Many mining companies and stakeholders are fully aware that sustainability reporting is a tool in need of continual improvement. A number of on-going initiatives, such as the standardization of external assurance on sustainability reports, corroborate this argument. This thesis tried to understand the limitations of these initiatives by undertaking an in-depth content analysis of a new Assurance Procedure being promoted by ICMM, one of the world’s most powerful mining associations. This investigation, featured in Chapter Five, was based on a systematic content analysis of that procedure as well as of the assurance statements being published in the reports of the world’s largest mining companies. The role of the content analysis in this chapter was to allow for a better understanding of the “extent” to which that procedure can enhance external assurance and sustainability reporting in general. For this purpose, very simple quantitative techniques (counting and percentage) were used. Full details

of these techniques will be explained in Chapter Five. The results of this quantitative analysis are presented in Appendix 3.

The content analysis undertaken to explore the barriers to implementing the requirements of the framework proposed in Chapter Four had a different rationale. The purpose was not to gain a quantitative sense of the barriers, but rather to identify the most relevant barriers, their characteristics and interactions. This approach was much more in line with the ones from studies formally employing grounded theory.

The 41 interviews, along with the literature reviews, generated a vast amount of data in connection with the potential barriers. Without a systematic content analysis of the themes “grounded” in that data, this thesis would have missed a great opportunity to further explore the problem. The content analysis involved an iterative identification and arrangement of the main themes in connection with the barriers to the implementation of the proposed framework’s requirements. These themes were arranged and re-arranged in sub-themes and sub-sub-themes many times, until a satisfactory diagrammatic pattern became clear. The main criterion used by the author to judge whether this pattern had been achieved was the perception of a simple and meaningful diagram that clearly communicated the nature and relationships of the most relevant barriers.

### *2.3.3 Data Analysis, Memo-writing, Storage, Diagramming, and Software Use*

Analysis of qualitative data can be challenging and controversial. Unlike quantitative research, which is based on numbers, mathematical formulas, and logical procedures of almost undisputed meaning, qualitative research often deals with subjective and value-laden language, concepts, images, and/or sounds. The analysis of such data often depends on the observer as well as on conceptual, theoretical and philosophical assumptions. Qualitative studies may be differently interpreted and not always reproducible. In this context, a sense of “validity” can only be achieved by clearly explaining the assumptions, approaches, and procedures involved in the analysis.

A number of different procedures can be used to analyse qualitative data. Matthew Miles and A. Huerman (1994, pp. 8-9) have distinguished three main schools of thought in this field that use a variety of techniques (*interpretivism, social anthropology, and collaborative social research*). In spite of this plurality, qualitative analyses usually share a number of common processes, such as data description, data classification, and data connection or comparison (Dey, 1993). This thesis employed these procedures and also software-based data management, memo-writing, and visual representation.

Two types of software were used to store, manage and analyze the vast amount of data collected in this research: Thomson's Endnote X2/X3 and QSR's NVivo 8. Endnote was used primarily to store the literatures reviewed and their respective abstracts and notes. About two thousand references were collected during the research. More than six hundred are cited here. The processes of storing, accessing, interpreting, comparing, and understanding the many concepts and ideas embedded in these references were enhanced and hastened by the use of Endnote. If this software had not been used, fewer sources would have been collected and analysed. Moreover, this software allowed for searches of contents, abstracts, and annotated memos within each reference, thus helping to organize and classify the literature.

The transcriptions and audio of the interviews were, in turn, stored and analysed with the help of QSR's NVivo 8. This software is particularly helpful in grounded theory studies, as it has several features that help to code, compare and write memos during the analysis of the interviews (Bringer, et al., 2006; Hutchison, et al., 2009; Kan & Parry, 2004). The term "in vivo coding", to which the software's name refer, actually comes from grounded theory (Bazeley & Richards, 2000, p. 24).

In her review of the pros and cons of using NVivo in qualitative analysis, Elaine Welsh concluded that researchers need to "recognise the value of both manual and electronic tools" and "not reify one over the other but instead remain open to, and make use of, each" (Welsh, 2002, p. 7). This advice was carefully considered in this research. NVivo was used here as "a" tool to help make sense of the vast amount of data embedded in the interviews. Its main

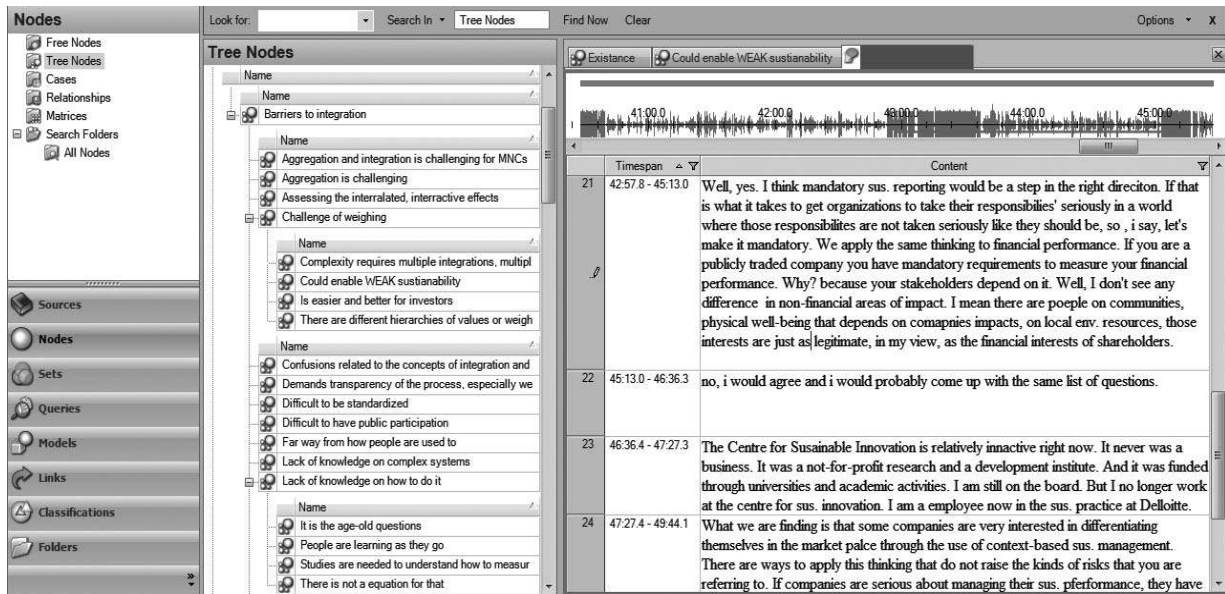


purpose was to help identify and correlate the many themes, sub-themes, and sub-sub-themes within interviewees' responses<sup>9</sup>. This process followed an iterative logic that was mindful of the contextual value of each of the identified themes. To ensure this context, the current version of NVivo software offers a very relevant feature: the link between audio and transcription. When analysing the data, the transcribed and codified themes can be constantly interpreted in light of the audio related to that particular section. NVivo played a robust role notably in the content analysis of the barriers to implementing the changes in the reporting framework proposed in Chapter Four.

During the transcription and analysis of interviews, the author made several memos of his insights, which could then be searched and correlated to the transcriptions. The various themes were arranged in many ways to help make sense of the data. Figure 2-2 shows a *printscreen* of the software that exemplifies one of three nodes created to organize the potential barriers to implementing the reporting requirements proposed in Chapter Four. The creation of nodes and themes like the ones showed in Figure 2-2 followed a highly iterative process. The research also used software like Microsoft Excel and CoreIDRAW. The former was used in the content analysis of mining companies' websites, sustainability reports, and external assurance statements, to help count the contents of themes across the data. CoreIDRAW was, in turn, used to design the various diagrams that illustrate the many concepts and arguments of this thesis. In addition, the software Skype 4.0 was used to call interviewees thus reducing the costs of the research. A Skype add-on (Pamela 4.5, developed by Scendix Software GmbH) was, in turn, used to record the audio that was later transferred to NVivo.

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<sup>9</sup> Qualitative data collection results in a flow of words that can be broken down into themes. But as Ian Dey noted, a variety of terms can be used to analyse and classify these themes: "I call these bits of data 'databits', but in other texts they may be referred to as 'chunks', 'strips', 'segments', 'units of meaning' and so on. I call the process of classifying these databits 'categorizing', but in other texts it is variously described as 'tagging', 'labelling', 'coding' and so forth. In the absence of linguistic consensus, the best one can do is to choose terms which seem appropriate, and define these terms as clearly as possible." (Dey, 1993, p. 9)



**Figure 2-2 - Software Used to Store, Code, and Analyze Interviews.**  
 (Details of the *print-screen* were erased with Photoshop to ensure confidentiality)

### 2.3.4 Data Limitations and Research Ethics

The software-based techniques used to store, code, classify, memo-write, diagram, and analyse, all helped to ensure the validity and reliability of the results presented here. Comparative analysis of information sources (data triangulation) was also very important in the validation process.

This study, nonetheless, has some data limitations. The most important one is that there are very few publications which relate the governmental perspective to the research problem. As a predominately non-regulated practice, sustainability reporting has been promoted and implemented primarily by private organizations. The author initially intended to overcome this lack of information by interviewing key informants from the few governments that are implementing sustainability reporting, but this solution proved to be unfeasible during the research. The author faced difficulties in identifying governmental informants who are participating or interested in sustainability reporting. None of the few potential participants identified in Europe replied to the author. As a result, this group of people was not considered

in this thesis. Other stakeholder groups, such as NGOs, were somewhat less difficult to reach. The imbalanced representation of groups evident in Table 2-1 reflects, to a certain extent, this problem. That imbalance also reflects the representativeness and importance that each group played in generating information and filling literature gaps. For example, the number of mining associations enforcing sustainability reporting today is relatively small. The author deemed that interviews with the senior management of three of the world's largest mining associations were enough for the purpose of this research.

As Appendix 1 shows, this research ensured that all interviewees were fully informed of the research purpose and procedures, as well as of the risks and potential benefits of their participation. A number of documents (forms, consent letter, and confidentiality statement) were reviewed and approved by the University of Waterloo's Office of Research Ethics before they were sent to the interviewees. The overall majority of the interviewees sent back a consent form to the author, in which they agreed, amongst others, with audio-recording and use of anonymous quotations in this thesis and related publications. Some interviewees also agreed with the use of "attributed" quotations. Only the responses from consenting interviewees were used in this thesis.

## **2.4 Summary**

This chapter introduced the conceptual/theoretical framework and the methodology. The decision to use a qualitative grounded theory approach to answering the research questions was justified on several grounds. Most notably, the exploratory nature of the research and the lack of relevant theories that could be used to test hypotheses related to the research problem suggested that a qualitative approach was most appropriate to the task at hand. Table 2-2 below summarizes the main techniques used to collect and analyse data. It shows the underlying purpose, unit and criteria of analysis, samples, and software used in each technique, thus highlighting the essential elements of the methodology.

**Table 2-2 - Summary of the Techniques of Data Collection and Analysis**

	<b>Purpose</b>	<b>Unit of Analysis</b>	<b>Sample</b>	<b>Analysis Criteria</b>	<b>Software Use</b>
Literature Reviews	<ul style="list-style-type: none"> <li>- Contextualize, justify, and corroborate the research’s objectives, methods, and findings.</li> <li>- Help to identify the key requirements for, and barriers to, strengthening corporate sustainability reporting in the mining sector</li> </ul>	Publications	Academic and grey literature from a variety of disciplines, sources, and timeframes that were deemed relevant to answer the objectives according to the theoretical framework.	Personal judgement on the reliability and relevance of published information	<ul style="list-style-type: none"> <li>- Endnote X3 (to help organize and analyse references according to themes and arguments)</li> <li>- NVivo 8 (to help organize, store, code, classify, and analyse arguments and themes)</li> <li>-CorelDRAW (to help build diagrams)</li> </ul>
Semi-structured Interviews	<ul style="list-style-type: none"> <li>- Help to identify the key requirements of effective corporate sustainability reporting frameworks</li> <li>- Understand the perspectives of mining stakeholders on the barriers to implementing a number of sustainability reporting requirements by mining companies and standard-setters.</li> </ul>	Individuals	Non-probabilistic, purposive sample of individuals with expertise in sustainability assessment, non-financial reporting, and corporate accountability.	Identification of arguments and themes in the answers given to pre-defined questions as well as in any additional comment or observation.	<ul style="list-style-type: none"> <li>- NVivo 8 (to help organize, store, code, classify, and analyse arguments and themes)</li> <li>- Endnote X3 (to help correlate interviewees’ arguments to literature)</li> <li>- CorelDRAW (to help build diagrams)</li> <li>- Skype 4.0 (to make telephone calls)</li> <li>- Pamela 4.5 (to record telephone calls)</li> </ul>
Content Analysis of Assurance Statements	<ul style="list-style-type: none"> <li>- Understand the benefits and limitations of standardized external assurance as a means to enhance sustainability reporting.</li> </ul>	Documents (Assurance statements and procedure)	Cross-sectional, purposive sample of assurance statements in the reports of member companies of the International Council on Mining and Metals	Gap analysis based on literature’s prescribed high quality contents of assurance statement	<ul style="list-style-type: none"> <li>- Excel (to help organize, store, count, code and classify the contents)</li> <li>- CorelDRAW (to help build diagrams)</li> </ul>

Content Analysis of Literature and Interviews	- Identify and correlate the main barriers to implementing a number of sustainability reporting requirements among mining companies.	Publications and Individuals	Non-probabilistic, purposive sample of literature and of experts in sustainability reporting in the mining sector.	Identification of arguments and themes in the literature and answers given to pre-defined questions, as well as in any additional comment or observation.	<ul style="list-style-type: none"> <li>- NVivo 8 (to help organize, store, code, classify, and analyse arguments and themes)</li> <li>- Endnote X3 (to help organize and analyse references according to themes and arguments)</li> <li>- CorelDRAW (to help build diagrams)</li> </ul>
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Chapter Two described the selected samples of publications, documents and individuals, as well as the codes that will be used to reference anonymous interviewees. What follows in the ensuing pages reflects these methodological choices, but with due respect for their limitations. Whenever necessary, comments will be made as to reliability and potential biases of particular information sources and analytical techniques.

## **Chapter 3 The Sustainable and Accountable Mining Corporation: A Conceptual and Critical Foundation**

### **3.1 Introduction**

This thesis addresses several fuzzy concepts, that is, concepts that possess values and contents which vary according to context. What is meant by sustainability, social responsibility, stakeholder theory, mining sustainability, accountability, sustainability assessment, frameworks, etc., may vary substantially among and within schools of thought. This chapter reviews the origins, definitions, and contested interpretations of some of these terms, including the ones that make up the conceptual/theoretical framework. The purpose is to illuminate the key concepts that are needed to answer the research questions.

As the following section outlines, business corporations have been gradually shifting their ethical rhetoric from social responsibility to sustainability. This phenomenon is being mirrored in the growing practice of sustainability reporting. This chapter will describe these developments with a particular emphasis on the mineral sector. It will explain the emergence of the sustainable and accountable mining corporation, while outlining key debates, institutions, actors, and sustainability initiatives. The roles of large mining corporations, including their sustainability reports, are highlighted as well as the need for understanding the opportunities for improving their respective frameworks.

Chapter Three provides a critical description of the research background. In doing so, it covers most (not all) relevant terms and issues that are needed to answer the two main research questions. Additional background information and definitions will be reviewed in the following chapters, particularly in the initial sections of Chapters Four and Five. Further definitions and contextualization will be provided as footnotes, when necessary, throughout the text.

### 3.2 Sustainable Development: The Rise of a Powerful Vision

During the twentieth century the “world population increased from 1.65 billion to 6 billion, and experienced both the highest rate of population growth (averaging 2.04 per cent per year) during the late 1960s, and the largest annual increment to world population (86 million persons each year) in the late 1980s” (United Nations, 1999, p. 1). “Global GHG [greenhouse gases] emissions due to human activities have grown since pre-industrial times, with an increase of 70% between 1970 and 2004”, (IPCC, 2007, p. 36). In the past 50 years, “humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history (...)” leading to “substantial and largely irreversible loss in the diversity of life on Earth” (MEA, 2005b, p. 1). “Humanity’s demand on the planet’s living resources, its Ecological Footprint, now exceeds the planet’s regenerative capacity by about 30 per cent.” (WWF, 2008, p. 2) In 2008, “almost half the world’s population – 2.6 billion people – continue[d] to live on \$2 per day or less; one billion of them on \$1 per day or less” (WRI, 2008).

For decades, such statistics have been feeding debates about the planet’s socio-ecological systems capacity to absorb fast and unequal economic growth. Conclusions in published analyses range from predictions of looming scarcity, famine and catastrophe (Ehrlich, 1971; Guggenheim, 2006; Meadows, et al., 1972) to assurances of resource availability, welfare and environmental quality (T. L. Anderson, 2004; Beckerman, 2002; Lomborg, 2001; Simon, 1981, 1996). Advocates of the latter position usually hold more optimistic assumptions concerning the power of technology, capital markets, and governance to address negative socio-environmental trends. Yet such views are the exception. Increasingly since the mid 1980s, politicians, chief executive officers (CEOs), activists, consumers, and scientists have been realizing that development’s *modus operandi* needs to move towards more sustainable paths.

While the term “sustainable” has long been used in environmental and conservationist debates (e.g. Goldsmith, et al., 1972), it only started to be widely and clearly associated with development and economic growth in the 1980s. Such an association was epitomized in the publication *World Conservation Strategy: Living Resource Conservation for Sustainable*

*Development* (IUCN, 1980). As John McCormick sagely put it, this publication “marked a shift from the traditional focus on cure rather than prevention, (...) and despite many omissions, it confirmed a growing belief that the assimilation of aims of both conservation and development was the key to a sustainable society” (McCormick, 1986, p. 177). Lester Brown published a report in the following year (1981) that helped to echo IUCN’s emphasis on the concept of sustainability. It was not until the report *Our Common Future* was published in 1987, however, that this concept started to attract worldwide attention.

*Our Common Future* was the outcome of the World Commission on Environment and Development (WCED), called upon by the United Nations in December 1983 to formulate an ambitious “global agenda for change”. Chaired by Gro Harlem Brundtland, this commission put forward several principles concerning population growth, human rights, poverty, environmental preservation, energy, industry and urban development. The report featured the concept of sustainable development, while influentially defining it as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987, p. 43). This definition contained two key sub-concepts:

- *The concept of ‘needs’, in particular the essential needs of the world’s poor, to which overriding priority should be given; and*
- *The idea of limitations imposed by the state of technology and social organization on the environment’s ability to meet present and future needs.* (WCED, 1987, p. 43)

Since 1987, countless governments, institutions, companies, treaties, regulations have endorsed the vision of sustainable development or its short form, sustainability<sup>10</sup>. Already in 1993, one of the pioneers of environmental economics, David Pearce, remarked that sustainability had become fashionable (D. Pearce, 1993, p. xvi). David Orr, realizing the fast pace under which the concept was being embraced worldwide, went further to claim that the subject of

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<sup>10</sup> Google Timeline View (a feature of the world’s leading internet search engine that graphically organizes the results of searched terms according to their respective time contents) hints at how influential this 1987 report has been. The search for the term “sustainable development” reveals three clear temporal peaks (Google, 2009). The first of which is precisely at 1987, which marks the beginning of a growing volume of online information containing the term “sustainable development”. The remaining peaks are at 1992 and 2002, which correspond respectively to the Earth summits of Rio de Janeiro in 1992 and of Johannesburg in 2002: two key global events that responded to the WCED’s call.



sustainability had become a growth industry (Orr, 1994, p. 931). J. G. Frazier illustrated the magnitude of this “industry” while compiling a variety of sustainability expressions that had emerged by the mid 1990s. Among those were “‘sustainable biosphere’, ‘sustainable ecology’, ‘sustainable equilibrium’, ‘sustainable environment’, ‘sustainable landscape’, ‘sustainable pest management’, ‘sustainable mountain development’, ‘sustainable upland management’, ‘sustainable tourism’, ‘sustainable transportation’, ‘sustainable urban transport system’, ‘sustainable enterprise’, ‘sustainable communities’, ‘sustainable society’, ‘US sustainability’, ‘sustainable way of life’, ‘sustainable improvement in the quality of living’, ‘sustainable economic growth’, ‘sustainable progress’, ‘sustainable future’, ‘sustainable planet’ and ‘sustainable world’” (Frazier, 1997, p. 183). Frazier’s compilation is but a small part of the plethora of “sustainable terms” in use. Among the “missing” ones are “sustainable corporation”, “sustainable mining”, and “sustainable mining corporation”, which will be discussed in the following pages.

The tragedy driving sustainable development is – to play on the terminology adopted by Garret Hardin (1968) in his influential *Science* article – a “common” one. Widening gaps between rich and poor, increasing global temperatures, resource depletion, soil erosion, loss of biodiversity, these are all interdependent problems that require a multiplicity of collaborative efforts. In this context, the growing “appropriation” of the sustainability concept as a vision by different sectors is more a positive rather than a negative trend. Sustainability needs to be pursued in different contexts and by different constituencies.

Regrettably, however, many governments, companies and individuals, while embracing sustainability, do not appear to achieve much beyond rhetoric (Evans & Abrahamse, 2009; Frazier, 1997; Parr, 2009). To a number of critics their efforts “seem to be symbolic gestures to allay public anxieties, not to get down to root causes” (Orr, 1994, p. 931). This phenomenon has also been referred to as *greenwash*, i.e.

*an environmental claim which is unsubstantiated (a fib) or irrelevant (a distraction). Found in advertising, PR [public relations] or on packaging, and made about people, organisations and products. Greenwash is an old concept wrapped in a very modern incarnation (Futerra, 2008, p. 1).*

While many social actors are susceptible to criticism, the least trusted sectors of the economy are the ones usually associated with *greenwashing*. Not surprisingly, the target audience of anti-greenwashing manuals and guidelines have been primarily business corporations (Bruno, 1992; Futerra, 2008; Horiuchi, et al., 2009; TerraChoice, 2007). These organizations are among the least trusted when it comes to “doing what is right” (Edelman, 2009).

For the past twenty years, scholars and organizations have been delineating the requirements of “serious”, “genuine”, or “strong” sustainability strategies (see Chapter Four). The effective and profitable operationalization of such requirements among corporations – and particularly among those whose business is to extract non-renewable resources all over the world – entails countless tensions and problems. Nevertheless, if the vision of a sustainable corporation is to be substantively pursued and communicated, companies and respective stakeholders will have no other option but to embrace this challenge.

### **3.3 From Socially Responsible to Sustainable Corporations**

Decades ago, Nobel Laureate economist Milton Friedman wrote that the social responsibility of a corporation is “to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game, which is to say, engage in open and free competition without deception or fraud” (Friedman, 1982, p. 133). This often quoted<sup>11</sup> and disputed position is hardly valid today. As James Aune observes, Friedman’s argument “depended heavily upon a Cold War narrative: the virtuous, free market United States battling the evil, collectivist East” (Aune, 2007, p. 214). Since then, expectations and perceptions of the role of corporations in a free market economy have changed dramatically. More inclusive theories (Freeman, 1984) about the nature of corporations have been created and, most importantly, endorsed by Chief Executive Officers (CEO). Corporate Social Responsibility (CSR) is stronger than ever. The fundamental question – should there be CSR? – is irrelevant

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<sup>11</sup> Friedman’s original argument “against” corporate social responsibility was published in his 1962 book, *Capitalism and Freedom*. These ideas were later presented in an article published in the New York Times Magazine (Friedman, 1970), which is the one often cited in CSR-related publications.

today; companies are already embracing the concept and trying to apply it (Franklin, 2008). What remains highly debatable is how best to act on a commitment to CSR.

CSR can be defined simply as the voluntary extension of businesses' responsibilities beyond making profit and complying with the law, or, more straightforwardly, as corporations trying to "do good" (Franklin, 2008). Although this practice can be traced back to the late industrial revolution, formal writing on CSR is largely a product of the twentieth century (Carroll, 1999). Among the most cited definitions of CSR is the one given by the World Business Council on Sustainable Development (WBCSD) (Dahlsrud, 2008): "the commitment of business to contribute to sustainable economic development, working with employees, their families, the local community and society at large to improve their quality of life" (Holme & Watts, 2000, p. 10). Many others definitions abound in the literature. The lack of a universally accepted notion of CSR is a result of the variety of interpretations that people hold about the boundaries of such a wider corporate responsibility (Lantos, 2001).

One of the most well-known attempts to theorize corporate responsibilities has been offered by Archie Carroll in his Pyramid of CSR (Figure 3-1). Carroll argues that businesses have four types of responsibilities. In addition to making profit and complying with the law, they can also be ethical and philanthropic. Carroll's model refers not only to corporations, but to business in general. As such, it is in line with Edward Freeman and Ramakrishna Velamuri's interpretation of CSR. These authors interpret the acronym CSR as "Company Stakeholder Responsibility", arguing that all business (from small privately-owned to transnational corporations) must pay attention to the general concerns of stakeholders (Freeman & Velamuri, 2006). Indeed, in the past decade or so businesses have been increasingly addressing the broader concerns of some of their main stakeholders. However, this trend is still uncommon among small and mid-size companies. It is the large, brand-sensitive corporations that have been embracing and pushing forward this ethics (Vogel, 2005, p. 167). After all, pressures from consumers, investors, and employees fall heavily on large powerful companies.



**Figure 3-1 - The Pyramid of Corporate Social Responsibility**  
Source: Adapted from Archie B. Carroll (1991, 2004)

A multiplicity of tools has been developed for the practice of CSR. These encompass, among others, codes of conduct, management systems, supplier certifications, social audits, strategic alliances, reporting guidelines, training, awards, and stakeholder dialogues. Earlier strategies based on philanthropy are no longer enough to cope with the perceived role of corporations in society. The practice of CSR has also expanded to encompass a wider range of issues. In addition to employee and human rights, businesses are dealing with ethical procurement, product impact, community welfare, biodiversity, eco-efficiency, indigenous rights, accountability, and, increasingly, sustainable development. The consideration of the latter in corporate discourse has intensified considerably since the early 1990s to the point that many are now seeing the lines between being socially responsible and being sustainable as a blurred one.

Some scholars disagree with the assumptions and rationale that frequently underpin the pursuit of sustainability by corporations (Beder, 2002; Bruno, 2002; Welford, 1997). It is undeniable, however, that these enterprises have been accelerating their attempts to be sustainable or to contribute to sustainability. Through stronger roles in international environmental summits, partnerships with NGOs, creation of international sustainability organizations and sustainability departments, these attempts are manifested in a variety of ways.

One of the earliest attempts to understand the implications of sustainable development for business was published in the book *Changing Course: A Global Business Perspective on Development and Environment* (Schmidheiny, 1992). Coordinated by the then-recently established Business Council for Sustainable Development<sup>12</sup>, the book “argued that sustainable development was not only good for business, it was ‘good business’.” (Najam, 1999) About 50 leaders of multinational corporations endorsed the book’s message, setting the ground for a growing scholarship on the implications of sustainable development for business.

Among the best-known works that followed up on the *Changing Course* publication are the ones from John Elkington (1997, 2004, 2006). Since 1994, Elkington has been advocating win-win strategies for sustainable corporations through the *triple bottom line* (TBL) concept. TBL, simply put, is an imperative to extend business’s concerns beyond the financial bottom line to include social and environmental issues that are relevant to stakeholders. In his most famous book, *Cannibals with Forks*, Elkington includes the caveat that even companies that have a deep understanding of TBL would be wary of using the term “sustainable corporation” (Elkington, 1997, p. 306). This concept, says Elkington, is enormously hazy. His own book, however, implicitly emphasizes that TBL may be the key ingredient of the “corporate sustainability recipe”. Some authors corroborate Elkington’s tacit call: “The Triple Bottom Line captures the essence of sustainability by measuring the impact of an organization’s activities on the world.” (Savitz & Weber, 2006, p. xii-xiii)

It should be noted that the first publications addressing the implications of sustainable development for business corporations, like the BCSD’s, very rarely used terms such as Corporate Sustainability (CS) (e.g. Capra & Pauli, 1995; Gladwin, et al., 1995; S. L. Hart, 1997; Hawken, 1993). This term has been more frequently observed in recent publications (e.g. Atkisson, 2008; Bansal, 2005; Dudok & Muir, 2006; S. L. Hart, 2005; Porritt, 2007; Sharma &

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<sup>12</sup> In 1990, Maurice Strong, then secretary-general of the 1992 UN Conference on Environment and Development, asked Stephan Schmidheiny to be his advisor on business and environment, leading to the creation of the Business Council for Sustainable Development (BCSD). This council merged with the World Industry Council for Environment (WICE) in 1995 and became the World Business Council for Sustainable Development (WBCSD), one of the most relevant international organizations promoting the “business case” for sustainable development. For more information on the history of this influential organization see Lloyd Timberlake’s (2006) book.

Starik, 2002; Sharma, et al., 2007; Steger, 2004; Zink, 2008). Yet the meaning of CS may differ substantially from author to author.

Wempe and Kaptein (2002) have defined CS as the ultimate goal of business. They interpret CSR as an intermediate stage through which companies can balance the triple bottom line in order to achieve CS. Many authors, however, take CS synonymously with CSR. As Atkisson has put it, CSR has been the “conceptual roof under which most corporate sustainability initiatives reside” (2008, p. 86).

Some scholars, such as Daniela Ebner and Rupert Baumgartner (2006), are concerned about the mixed use of these terminologies. These authors analysed the business literature trying to understand how the two concepts had been related to each other. They examined 55 articles questioning whether CSR was being framed: (1) as a base for sustainability, (2) synonymously with sustainability; (3) as the social strand of sustainability; or (4) under some other relationship. Their results indicated that the synonymous relationship was the most frequent. “[A] trend to define CSR similar to SD [sustainable development] has come up” (Ebner & Baumgartner, 2006, p. 09). This conclusion may have been influenced by the considerable number of accountability-related articles that they reviewed. As the next section will show, the corporate accountability field has suffered from a lack of rigor in the interpretation of the sustainability concept.

Ivan Montiel (2008, p. 264) revisited the definitional conflicts between CSR and CS recently and found slightly different results. After screening 91 business and management-related articles published between 1970 and 2005, he found that the “conceptualizations and measures of CSR and CS seem to be converging”. Montiel, however, noted that CS scholars tended to address the social, economic, and environmental dimensions of sustainability as interconnected, whereas CSR research addressed them mostly as independent components. CS scholars also seemed to display a more eco-centric view of the challenges facing business. This last finding is very much in line with another recent study by Alexander Dahlsrud (2008). This author, as opposed to comparing CS and CSR definitions and applications, undertook an in-depth content analysis of the latter. He evaluated the extent to which 37 definitions of CSR,

published from 1980 to 2003, addressed 5 dimensions (social, environmental, economic, stakeholder, and voluntariness). Generally the definitions were congruent, but “the environmental dimension received a significantly lower dimension ratio than the other dimensions” (Dahlsrud, 2008, p. 5).

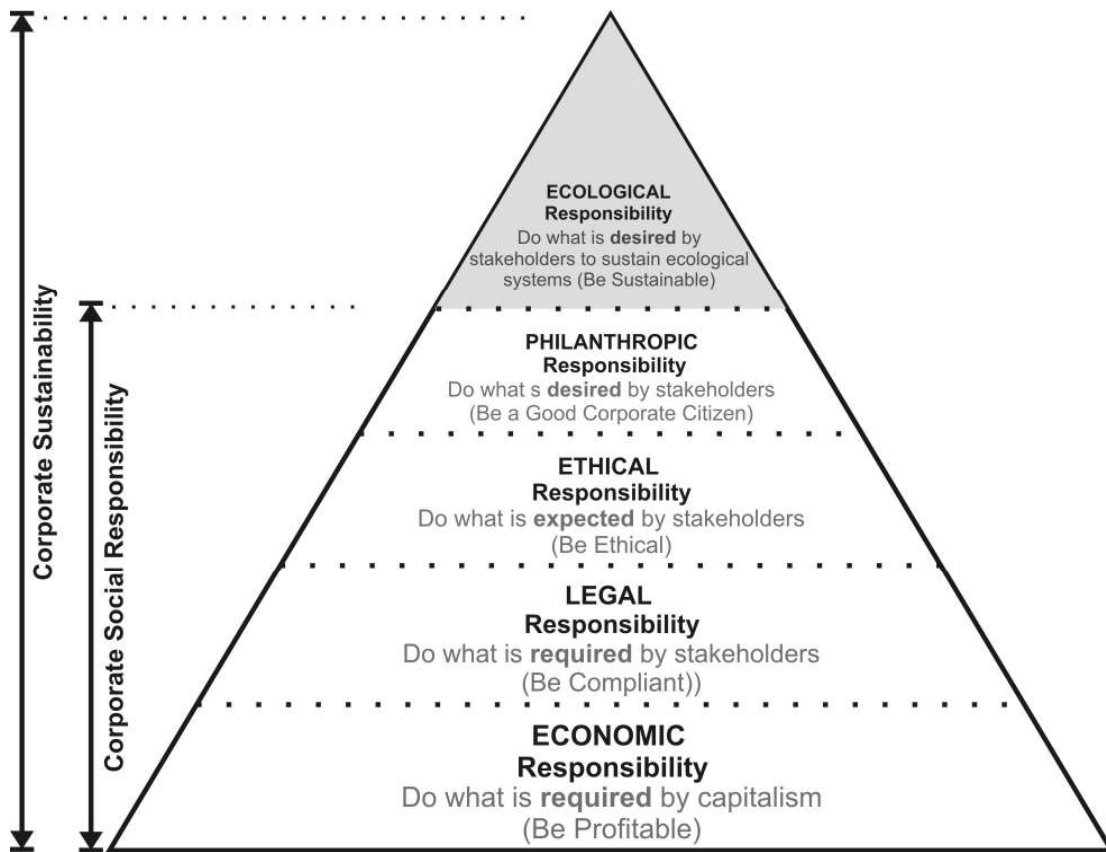
Altogether, these and other similar studies (Cowe & Timberlake, 2008; Marrewijk, 2003; Moon, 2007; Springett, 2003; M. Wilson, 2003) reveal that, despite the existence of confusion with CSR and other concepts such as Corporate Citizenship and Corporate Responsibility, Corporate Sustainability is emerging as a trendier and broader concept. It shares some of the CSR tenets, like stakeholder inclusiveness and accountability, but builds on sustainability principles, notably ecological ones. As such, Corporate Sustainability is starting to be seen as a more robust conceptualization of business ethics. A conceptualization that, according to John Porritt, is needed to overcome the limitations of earlier CSR strategies:

*Before now, people have tended to use CSR and corporate sustainability interchangeably, as if they were one and the same thing. They aren't. And in a world that now knows itself to be imminently threatened by climate meltdown, a different kind of leadership is clearly called for. Unfortunately, the dominant business model for most companies today remains 'business as usual' with CSR strategies retrospectively welded on. Just as politicians are now having to address the utter inadequacy of their 'progress as usual' political models, based essentially on cranking up levels of economic growth at almost any cost to society and the environment, so any serious business leader is going to have to renounce that 'business as usual' model, and start working out what **real** corporate sustainability looks like in a changing world. (Porritt, 2007, p. 273)*

In line with Porritt's argument, Dunphy and others (2007) believe that Corporate Sustainability represents a more mature stage in the relationship of business with society. These authors conceptualized this relationship in three consecutive waves. In the first, corporate actors were either opposing or ignoring unregulated ethical imperatives. Shareholder returns and maximum resource exploitations were central elements. In the second wave, businesses started to expand their responsibilities towards unregulated issues in connection with their stakeholder's interests and the environment. Nonetheless, the motivation for this wider responsibility was predominately related to risk management, cost efficiency, and/or competitive advantage. The

third wave, in which the “sustainable corporation” emerges, the motivations are different. In this wave, “the organization becomes an active promoter of ecological sustainability values and seeks to influence key participants in the industry and society in general. Environmental best practice is espoused and enacted because it is the responsible thing to do.” (Dunphy, et al., 2007, p. 27)

Recent scholarship suggests that Carroll’s pyramid of CSR, shown earlier in Figure 3-1, is insufficient in delineating the responsibilities imposed by sustainability. Another “level”, addressing an “ecological” dimension would be required for that purpose. Figure 3-2 below shows one of the potential ways through which this incremental responsibility can be represented.



**Figure 3-2 - Corporate Sustainability Versus Corporate Social Responsibility**  
 Source: Adapted from Archie B. Carroll (1991, 2004)



The top of the pyramid, similar to the latest *wave* of Dunphy and others (2007), places “ecological responsibility” as the “highest” one, through which corporations do what is “desired” by stakeholders to sustain ecological systems. Yet behind the simplicity of this representation lie several operationalization and interpretational problems. For example, which stakeholders should be listened to? Which ecological systems should be preserved? How to identify and pursue opportunities for mutually supportive ecological economic, social and legal responsibilities? Moreover, a deep ecologist<sup>13</sup> might argue that doing what is desired by “stakeholders” is a rather anthropocentric view of corporate responsibilities, and that a “true” ecological responsibility would imply doing what is “required by ecosystems”.

What exactly corporate sustainability means, implies or looks like may vary according to the epistemologies, ideologies, or worldviews underpinning the context in which the concept is addressed. Some authors have argued that “a general, widely accepted definition of corporate sustainability is essential for interested parties, such as academics, managers, and policy makers, in order to establish a common language and understanding for such a key and commonly used concept” (Nikolaou & Evangelinos, 2008, p. 406). Nevertheless, this argument is somewhat naïve in its search for consensus over the meaning of an evolving construct that spans several ethical imperatives across several social groups. Some degree of variation in the meaning of Corporate Sustainability is not only acceptable, but inevitable.

Marcel van Marrewijk and Marco Werre also concur on a pluralistic interpretation of CS. They have proposed a rather flexible concept, made up of 6 levels: *Pre-CS*, *Compliance-Driven*, *Profit-Driven*, *Caring CS*, *Synergistic CS*, and *Holistic CS* (Marrewijk, 2003; Marrewijk & Werre, 2003). Such a conceptualization seems, however, a bit excessive, as it addresses CSR and even pre-CSR management models as representatives of low-levels of CS. Thus Marrewijk and Werre’s proposition may bring more complications to the already intricate concepts underpinning contemporary business ethics.

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<sup>13</sup> Deep ecologist” is a term usually associated with those people/institutions who embrace the deep ecology concept, coined by Arne Naess (1973) and further developed by several scholars. Deep ecology argues, for example, that humans have no right to reduce the richness and diversity of life on Earth, except to satisfy vital needs (Naess & Sessions, 1984). Deep ecology also puts emphasis on non-anthropocentric conceptualizations of the ecological crisis, and, because of its apparent radicalism, is usually placed in the extremities of the spectrum of environmental thoughts (e.g. Hay, 2002; Sherer & Attig, 1983; Sylvan, 1994).

More important than developing a “general” or “workable” definition, current scholarship needs to advance knowledge on how to translate CS into modes of operation, production, and services that effectively contribute to sustainable development. A corporation that promotes sustainability under the auspices of CSR is preferable to one that vests business as usual practices with sustainability rhetoric. The fundamental problem of the emerging field of corporate sustainability is less semantic and more practical. Once corporations start to understand how to contribute effectively to sustainability, less conflicting and contentious definitions are likely to emerge. This, however, may not come any time soon. As the next pages will discuss, corporations are just beginning to grapple with what a “contribution” to sustainability is or should be.

### **3.4 From Socio-environmental to Sustainability Accountability**

The concept of accountability has been studied and applied in several disciplines, such as administration, philosophy, political science, economics, and psychology. Each discipline has particular interpretations and taxonomies. In the context of public administration, accountability has been defined as “the obligation of authorities to explain publicly, fully, and fairly, how they carry out, or fail to carry out, responsibilities that affect the public in important ways”(Callahan, 2007, p. 108). Marvin Scott and Standford, searching for a more “pure” definition, called it “a statement made by a social actor to explain unanticipated or untoward behaviour (...)” (Scott & Lyman, 1968, p. 46). Andrea Schedler and others argued that the term is made up not only of *answerability* connotations, but also of *enforcement* ones. “Accountable persons not only tell what they have done and why, but bear the consequences for it, including eventual negative sanctions” (Schedler, et al., 1999, p. 15). Although frequently found in the literature as a product of democracy, the idea of accountability existed long before the emergence of democracy in Ancient Greece (Dornum, 1997). Interestingly, it exists today even within countries whose language does not have a direct translation for the term. In those countries, words such as “responsibility”, “accounts disclosure”, “transparency” or strange neologisms are often used as substitutes.

Accountability, simply put, is an imperative to account for one's action. This imperative may be moral, legal, or fiduciary; the actions may come from government, people, corporations or NGOs. And the nature of this account will vary according to the context. It can take the shape of verbal communications or elaborate financial statements and public reports. Accountability has been increasingly seen as an essential element of good corporate governance. Numerous publications and managerial practices are addressing their confluence, searching for theories, methods or approaches to enhance synergies.

As discussed above, corporations have responsibilities, and several from which society expects accounts. The types of responsibility determine the types of corporate accountability. For instance, the legal obligation to report financial performance to shareholders is known as financial accountability, which is manifested in the form of financial statements and balance sheets. Financial accountability is perhaps the best known and demanded type of corporate accountability. The headlines triggered by accounting scandals (and more recently by the subprime mortgage crisis) highlight the critical need for credible accounts of companies' financial health. This field has been regulated and investigated for centuries by governments and scholars from various disciplines.

A relatively new type of accountability is proving to be relevant to corporations as well: the social and environmental ones. This type of corporate accountability has been developing since the 1970s (Mathews, 1997). Corporations have been increasingly realizing that, in addition to financial accounts, they need to disclose their impact on, and contributions to, society and the environment. This morality has been translating into the publication of corporate reports covering a variety of non-financial information. Although several jurisdictions have regulated this type of disclosure (UNEP and KPMG, 2006), it still remains a largely voluntary practice.

The social and environmental reporting phenomenon is receiving growing academic attention, notably from scholars in the accounting and organizational management field who are interested in the motivations of this practice. According to Rob Gray and others (Gray, et al., 1995) the theories being used in these studies can be grouped in: (1) decision-usefulness of

information; (2) economic theories; and (3) social and political theories. The latter, which include *stakeholder theory* and *legitimacy theory*, have been the most frequently employed ones (Gray, et al., 1996).

### 3.4.1 *Stakeholder and Legitimacy Theories*

The idea of stakeholder theory started to receive significant attention in organizational and management research after 1984, when Edward Freeman published *Strategic management: a stakeholder approach*. In this book, “stakeholders” were defined as “all of those groups and individuals that can affect, or are affected by, the accomplishment of organizational purpose” (Freeman, 1984, pp., p. 25). Freeman advocated a new conceptual and ethical approach to managing organizations, in which the interests of stakeholders are taken into account. Stakeholder, as Freeman later wrote, was an obvious literary device meant to call into question management emphasis on “stockholders” (Freeman, 1999).

The seminal ideas of Freeman gave rise to numerous debates in academia, including the contentious issue of how to define and structure “a” stakeholder theory (T. M. Jones & Wicks, 1999). Other frequently discussed operational and instrumental issues include “who is a stakeholder?” and “how to prioritize and balance stakeholders’ interests?” (R. K. Mitchell, et al., 1997) Such discussions are frequently addressed in connection with concepts such as CSR and Corporate Sustainability, i.e. in those contexts where the relationship of business, society, and the environment is at stake.

Social and environmental reporting is closely related to stakeholder theory, as the former is being addressed (not necessarily explicitly) to companies’ stakeholders such as suppliers, communities, employees, governments, and so forth. As a result, stakeholder theory is frequently used to explain or describe corporate reporting practices (e.g. Elijido-Ten, 2007; Greenwood, 2001; Roberts, 1992).

Legitimacy has, in turn, been defined as “(...) a condition or status which exists when an entity’s value system is congruent with the value system of the larger social system of which the entity is a part. When a disparity, actual or potential, exists between the two value systems, there is a threat to the entity’s legitimacy” (Lindblom, 1994). Legitimacy theories are premised on an assumption that an organization’s existence depend on how society perceives the organization. As such they are consistent with political economy, social contract, and institutional theories, which place organizations as part of a broader, interconnected social, political, institutional, and economic system.

Scholars who draw on these theories usually explain or question reporting as a reaction to organizational legitimacy threats. Clear examples of such approaches are longitudinal studies that investigate the correlation of companies’ social and environmental problems with changes in their reporting practices (Campbell, 2000; Deegan, et al., 2002; Guthrie & Parker, 1989; Patten, 1991; Villiers & Staden, 2006). Rob Gray and others (1996) argue that there is also a second variant in the use of legitimacy theories, in which reporting is seen not only as a device to legitimise the organization, but also the *system* (e.g. capitalism, natural resources exploitation) in which organizations operate. Craig Deegan, while revisiting the use of legitimacy theories in social and environmental reporting, noticed some relevant gaps. For instance, he highlights that few studies are trying to understand whether the legitimising effect of reporting actually takes place. He also notes a lack of knowledge of how this effect varies among different groups of stakeholders (Deegan, 2007).

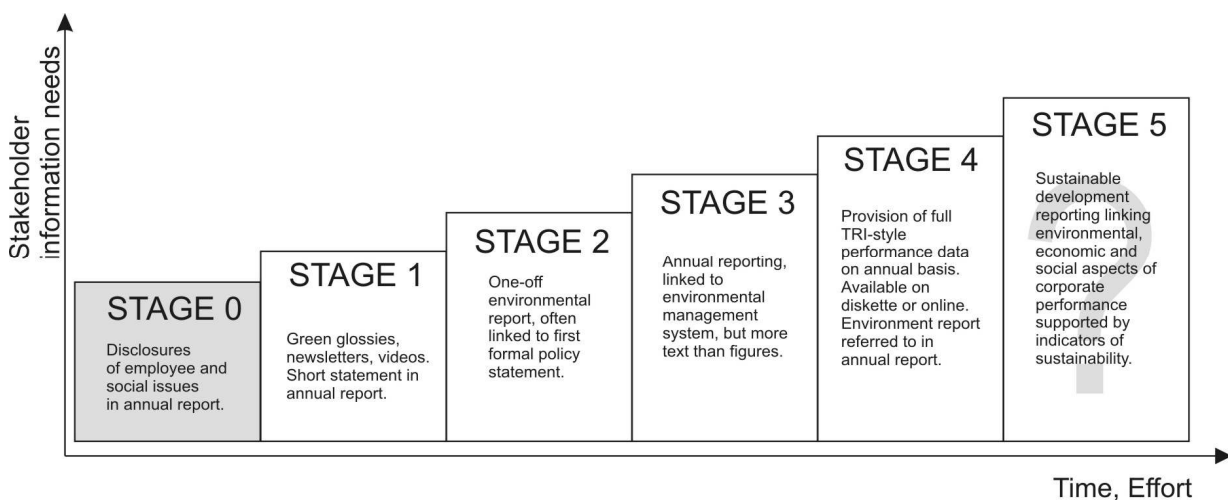
Legitimacy and other social and political theories can be taken individually, in a somewhat purist theoretical approach. Sometimes, however, they are considered in combination, often for the purpose of explaining or describing the non-financial reporting phenomenon.

### 3.4.2 *The Contested Rise of Sustainability Reporting*

One of the first surveys on the state of corporate non-financial reporting, the *Coming Clean* report (Deloitte/IISD/SustainAbility, 1993), foresaw the emergence of sustainability reports.

That publication placed sustainability reporting in the last of five stages in the evolution of non-financial reporting (Figure 3-3). Glossy environmental disclosures were in Stage 1. Recent scholarship has more accurately shown that before the “environment” type of report, many corporations were already disclosing employee and community information in their annual reports (Buhr, 2007). The Stage 1 to which the *Coming Clean* report refers came after a longer “Stage 0”, when social disclosures were predominant.

But *Coming Clean* was quite accurate in foreseeing corporation’s trying to meet stakeholder’s growing information needs through sustainability reports. As recent surveys show (CorporateRegister, 2009; CorporateRegister.com, 2008b), “sustainability report” has become the predominant term used to describe current non-financial disclosures.



**Figure 3-3 - The Evolution of Non-financial Reporting**  
Adapted from Deloitte/IISD/SustainAbility (1993).

Unlike the sustainable development concept, which had a particular point in time (1987) setting a “sense of birth”, the term sustainability reporting was brought into life during years of evolution in the field of social and environmental reporting (CorporateRegister.com, 2008b; UNEP and KPMG, 2006; UNEP/SustainAbility, 2004, 2006). No organization or scholar seems to have coined the term, as John Elkington did with the triple bottom line concept (Elkington, 1997, 2004).

Among the most cited definitions of sustainability reporting are the ones from the Global Reporting Initiative (GRI), a multi-stakeholder institution collaborating to provide global standards in sustainability reporting, from the aforementioned WBCSD, and from AccountAbility, a leading professional institute whose mission is to promote accountability for sustainable development through its AA1000 series (Table 3-1).

**Table 3-1 - Definitions of Sustainability Reporting**

<b>GRI</b>	<p>Sustainability reporting is the practice of measuring, disclosing, and being accountable to <u>internal and external stakeholders</u> for organizational performance towards the <u>goal of sustainable development</u>. ‘Sustainability reporting’ is a broad term considered <u>synonymous</u> with others used to describe reporting on economic, environmental, and social impacts (e.g., triple bottom line, corporate responsibility reporting, etc.). A sustainability report should provide a balanced and reasonable representation of the sustainability performance of a reporting organization – including both positive and negative contributions (GRI, 2006b, p. 3).</p>
<b>WBCSD</b>	<p>We define sustainable development reports as <u>public reports</u> by companies to provide <u>internal and external</u> stakeholders with a <u>picture</u> of corporate position and activities <u>on economic, environmental and social dimensions</u>. In short, such reports attempt to describe the company’s <u>contribution toward sustainable development</u>. A ‘one-size-fits-all’ approach does not work for sustainable development reporting. It is up to each company to <u>determine the approach it wishes to take</u>, depending on its situation and needs. Be it an environmental report, a social report, an environment, health and safety report or an integrated report – also called triple bottom line, sustainable development or sustainability report – all these various reporting formats contribute toward sustainable development reporting (WBCSD, 2003, p. 7).</p>
<b>AccountAbility</b>	<p>The Report is a set of information prepared by the Reporting Organisation about its <u>sustainability Performance</u>, whether for general publication, targeted external distribution or <u>internal use</u>. This will generally refer to information contained within a specific Report prepared periodically to inform Stakeholders about the organisation’s <u>Sustainability Performance</u>. The Assurance Provider may, however, choose to take a wider range of information into account when, for example, the main Report forms part of a broader set of communications on issues and aspects of performance they are assuring (AccountAbility, 2003, p. 32).</p>

The definitions in Table 3-1, although similar, reveal subtle wording differences. The WBCSD, for example, states that sustainability reports provide a “picture” or a “contribution” to sustainable development, whereas both GRI and AccountAbility claim that reports provide the sustainability “performance” of the organization. The GRI and the WBCSD makes clear the need to report on the three bottom lines, i.e. economic, social, and environmental aspects. But the GRI goes beyond the WBCSD by stating that the report can also provide information on negative contributions to sustainable development. Another discrepancy is found in AccountAbility’s definition, when it states that not only external, public reports, but also internal ones, are representative of sustainability reports.

To Milne and Gray there are two fundamental problems of definition with corporate sustainability reporting. “These are defining what is (or is not) a ‘sustainability’ report and, second, what different parties mean by ‘sustainability’” (2007, p. 184). “How should someone call a report?” has become a controversial issue. According to UNEP and SustainAbility the answers to this question...

*(...) varies by region, by industry and by company, over time. Among current favourites: corporate responsibility, CSR, extra-financial, GRI-style, environmental social and governance (ESG), non-financial, social and environmental performance, and sustainability reporting. “There is no perfect answer,” said one of our advisors. “This feels like the old battle between the accountants and the environmentalists,” said another. “Words like ‘non’ and ‘extra’ imply the accountants are core — and activists have lost the battle.” In response one analyst suggested if it was non-financial, he’d be out of a job. Yet another observed, “It would be good to see consensus on a preferred nomenclature.” (UNEP/SustainAbility, 2006, no page number)*

In spite of these terminological nuances, the fact is that organizations are increasingly using the term “sustainability reporting” to describe their non-financial disclosures. This trend has been driven substantially by the dissemination of the Global Reporting Initiative framework, a voluntary reporting tool that uses the term *sustainability* to describe disclosures on the so-called three dimensions of sustainable development.

### 3.4.3 *The Influential Role of the Global Reporting Initiative*

GRI has its roots in the US-based Coalition for Environmentally Responsible Economies (CERES) and the Tellus Institute. These organizations were promoting environmental reporting in the early 1990s to ensure that corporations would follow the CERES Principles for Responsible Environmental Conduct (CERES, 1989)<sup>14</sup>, an initiative that could easily fit into the category of CSR. Back then, the uptake of environmental reporting in North America was

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<sup>14</sup> One of the 10 principles stated that “we will conduct an annual self-evaluation of our progress in implementing these Principles. We will support the timely creation of generally accepted environmental audit procedures. We will annually complete the CERES Report, which will be made available to the public.”



rather slow. This situation suggested that “it was time to look beyond the borders of the US for markets to those that were more receptive to the idea of a generally accepted framework... in short, it was time for a Global Reporting Initiative” (GRI, 2007). Moreover, a variety of co-existing non-financial reporting frameworks, guidelines, norms, standards, and codes were becoming “messy”, thus frustrating the various parties interested in reporting (Dingwerth, 2007, p. 103).

In 1997, CERES idealized the GRI as a tool capable of overcoming some of these problems. In 1998, trying to boost its global presence, CERES partnered with UNEP and established a multi-stakeholder committee responsible for the creation of the framework. This committee soon advised that the GRI should “do more than the environment” and address social, economic, and governance issues (GRI, 2007). This advice was immediately incorporated into GRI’s reporting framework and thus a sustainability-oriented reporting guide, inheriting much of the rationale of the early 1990s’ environmental reports, was born. According to one of GRI’s co-founders and former CEO, Allen White (1999, p. 38), the initiative emerged as a distinct one because it: a) was governed by a multi-stakeholder steering committee; b) [attempted] to advance true corporate sustainability reporting; and c) [emphasized] the concept of standardization.

GRI piloted a draft framework in 1999. The official and revised version of the framework was published in the year 2000 with several outreach events held worldwide. By then, GRI was still “attached” to CERES. It was not until mid-2002 that the GRI was established as an independent, not-for-profit institution. This institutional shift came also with geographical and administrative changes. GRI was relocated to Amsterdam and Ernst Ligteringen assumed the chief executive office.

The GRI currently describes itself as “a multi-stakeholder governed institution collaborating to provide the global standards in sustainability reporting” (GRI, 2009b). It is overseen by a board of directors and coordinated by a secretariat. The board is comprised of 16 members from international organizations, consultancies, accountancies, NGOs, business groups, and scholars. GRI’s governance also includes a Stakeholder Council, a Technical Advisory

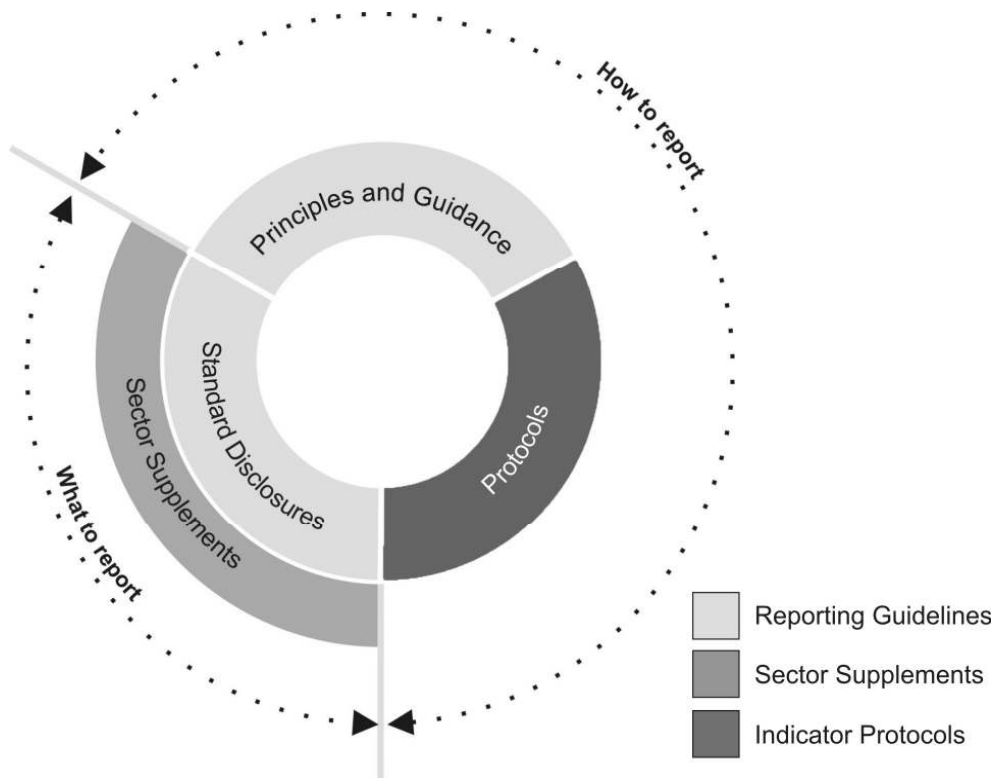
Committee, a Governmental Advisory group, and an Organizational Stakeholder group. The institution's funding comes from a variety of governmental, foundational, and individual sources. The provision of learning, training and other services complement the budget.

GRI's main product, the GRI G3 framework, is currently made up of three main elements that provide guidance on "how to report" and "what to report". These elements, which are illustrated in Figure 3-4 below, can be described as follows (GRI, 2006b):

**Sustainability Reporting Guidelines:** This document is the cornerstone of the framework, as it sets quality and content principles, as well as managerial and performance indicators. The principles for defining content include materiality, stakeholder inclusiveness, sustainability context, and completeness. The indicators (about 130) cover the following categories: Strategy and Analysis; Organizational Profile; Report Parameters; Governance, Commitment and Engagement; and Indicators of Management Approach and Performance. The latter covers, in turn, economic, environmental, social, human rights, society, and product responsibility issues.

**Indicator Protocols:** These protocols provide definitions and technical and methodological guidance on each of the performance indicators of the guidelines. Its main objective is to ensure consistency in the application of the indicators.

**Sector Supplements:** The supplements provide additional guidance and indicators for sector-specific issues. One of the supplements that is being piloted is the Mining and Metals Sector Supplement, which will be further discussed in this thesis.



**Figure 3-4 - GRI G3 Sustainability Reporting Framework**  
Adapted from GRI (2006b, p. 3)

One of the most important changes brought up by the newest G3 version was an Application Level (A+, A, B+, B, C+, or C) to “demonstrate a pathway for incrementally developing, expanding, and deepening approaches to reporting over successive cycles” (GRI, 2006a, p. 4). The guidelines require organizations to self-declare their level, or hire a third-party organization or the GRI institution to check their self-declaration.

Since the publication of its first draft in 1999, the GRI framework has been remarkably influential. It was among the few voluntary initiatives explicitly mentioned in the Plan of Implementation of the 2002 Earth Summit (UN, 2002, p. 57). Already in 2003, a study of the World Bank found that GRI was the second most influential global standard on corporate social responsibility practices (Berman & Webb, 2003). Renowned global leaders, like Al Gore (Russel, 2006) and Kofi Annan (H. S. Brown, et al., 2007), have praised the initiative, thus echoing its potential virtues.

GRI's growing prestige is reflected in its widespread adoption among large companies. More than three-quarters of the world's 250 largest companies and nearly 70 percent of the 100 largest companies in 22 countries are using the GRI (KPMG, 2008). The overall number of companies using the framework has increased from a few in 1999 to over a thousand in 2008 (GRI, 2009c). Another unknown but likely large number of organizations, while not explicitly adopting the framework, follow several of its reporting rationales. GRI's influence has also extended to other standard-setters: "(...) aspects of GRI thinking and process, especially the concepts of materiality and stakeholder engagement in the development of guidelines and reports, have diffused to other reporting frameworks and into the wider business community" (Brown, Jong, & Levy, 2009, p. 573). Not surprisingly, the GRI framework is seen by many people and institutions today as the global *de facto* standard in sustainability reporting.

#### *3.4.4 Critiques of the Global Reporting Initiative or Triple Bottom Line Model*

In a recent book chapter addressing the histories of, and rationale for, sustainability reporting, Nola Buhr stated at the very outset that she was not convinced that such a thing as "sustainability" reporting existed: "So it would seem (...) this is a chapter on the history of and rationales for something that is yet to be and, quite possibly, may never be" (Buhr, 2007, p. 57). From Buhr's point of view, sustainability reporting has only reached as far as TBL, i.e., reporting on some environmental, social and economic indicators. To deserve the status of "sustainability" this practice would need to address and enable the understanding of key requirements of sustainable development, such as long timeframes, inter and intragenerational justice, values, scarcity of natural and social capital, among others. Figure 3-3 above has a question-mark in the background of Stage 5 to illustrate this debate on whether corporations are actually reporting their contributions to sustainability or simply "naming" their reports as "sustainable" ones.

Critiques such as Buhr's are increasingly being published, very often underpinned and corroborated by the works of the accounting professors Rob Gray, Jan Bebbington<sup>15</sup>, and Markus Milne (Gray, 1996; Gray & Bebbington, 2000, 2007; Gray & Milne, 2002; Milne, Ball, et al., 2005; Milne & Gray, 2007; Milne, Tredidga, et al., 2005). These authors are very critical of the use of the term sustainability in corporate non-financial reporting.

A notable example of their views is in the somewhat provocative 2002 paper *Sustainability Reporting: Who is Kidding Whom?* (Gray & Milne, 2002), which has been further elaborated in recent publications (Gray, 2010; Gray & Bebbington, 2007; Gray & Milne, 2005; Milne, Ball, et al., 2005). These authors argue that the emergence of Elkington's TBL idea was important to non-financial reporting insofar as it helped organizations to widen the transparency and accountability of a number of social and environmental issues. But, in doing so, the TBL approach overlooked "that there is an essential conflict between financial and other bottom lines which, for the foreseeable future at least, the financial will always win; and... that TBL is not the same as sustainability despite the rhetoric that would suggest otherwise"(Gray & Milne, 2002, p. 4). The authors argue that TBL reporting may be a necessary condition for sustainability, but unlikely to be a sufficient one. To achieve sustainability reporting, they argue, "we need to have a detailed and complex analysis of the organisation's interactions with ecological systems, resources, habitats, and societies, and interpret this in the light of all other organisations' past and present impacts on those same systems.", and we also need "a shift in emphasis towards accounting *for* ecosystems and to accounting *for* communities" (Gray & Milne, 2002).

While this nomenclature conflict in reporting may be perceived as irrelevant and ignored by some (or most) organizations, Gray and Bebbington see serious dangers.

*...the widespread upbeat claims about the quality, diversity and incidence of 'reporting on sustainability' that are not carefully qualified might be thought to be, at best, misleading. Equally, any report which only covers selected elements of an organization's activity around a concept that it blatantly fails to define might, and not*

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<sup>15</sup> Both Gray and Bebbington are from the Centre for Social and Environmental Accounting Research, which is a relevant locus of research related to social and environmental reporting. See <http://www.st-andrews.ac.uk/management/csear/index.html> (Retrieved January 20, 2010).

*entirely unkindly, be thought a trifle dishonest, perhaps? ... As things currently stand, we believe we must treat the current crop of 'sustainability reports' with the profoundest mistrust as one of the most dangerous trends working against any possibility of a sustainable future. (Gray & Bebbington, 2007, p. 386-387)*

A study by Moneva, Archel & Correa (2006) that assessed the sustainable development approach of the GRI G2 guidelines corroborates Gray and Bebbington's perception. According to Moneva and others, the GRI approach to reporting sustainability has significant problems that may ultimately camouflage organizations' un-sustainability. After all, companies who follow the GRI framework:

- *Run the risk of losing sight of the big picture for sustainability (globalization, trade, north-south divergence . . .);*
- *Obscure the acquiring of an integrated view of business sustainability removing the development of integrated indicators as the way forward;*
- *Contribute to perceive the SD concept from a reductionism approach placing the three dimensions of sustainability at the same level and forgetting constituents interaction and participation; and*
- *Promote the construction of a set of indicators instead of instilling business with values to change their mentality so they can subscribe to the assumptions of SD. (Moneva, et al., 2006, p. 135)*

Research like Moneva's and Gray's – examples of a growing scholarship (Byrch, et al., 2007; Crowther, et al., 2006; Laine, 2005; Milne, et al., 2006; Richardson, 2004) – are important not only because they question the appropriateness of framing current social and environmental disclosures as “sustainability” reports, but mainly because they warn that this practice can actually lead to flawed decision-making. The wording, assumptions and upbeat tone of sustainability reports can, ironically, work against sustainable development.

These debates are prevalent among academic audiences, and particularly among those interested in corporate non-financial accountability. Yet the media are gradually recognizing the problems behind this practice. During the *Amsterdam Global Conference on Sustainability and Transparency*, in May 2008, the British Broadcasting Corporation (BBC) featured a one-hour debate with sceptics and enthusiasts of sustainability reporting, in which several of the problems above were addressed. The program was broadcast internationally seven times on

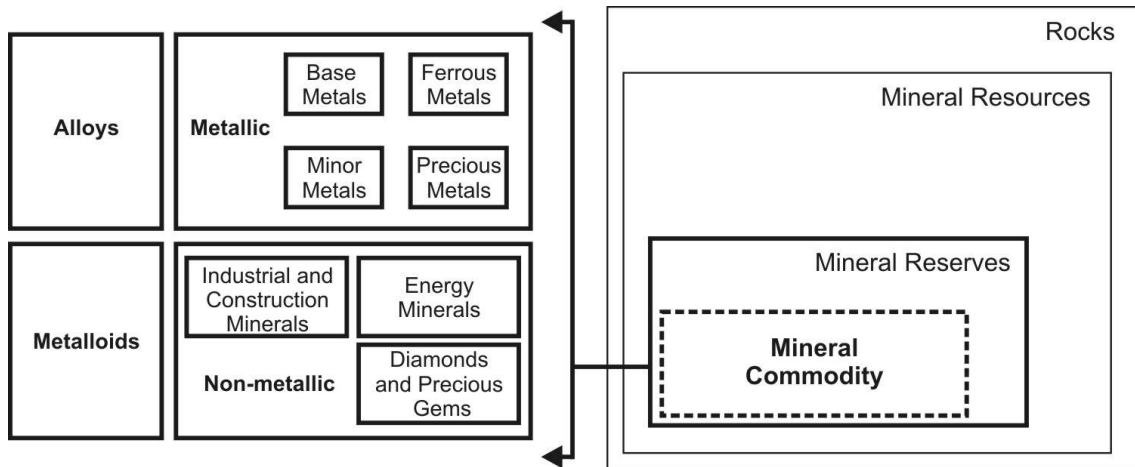
BBC World News (BBC, 2008; GRI, 2008a), echoing the need for a further understanding of how business can, and should, be held accountable for sustainable development.

The BBC program was particularly valuable in revealing that the answers to some of sustainability reporting' most relevant issues are not likely to be generic ones. Sectors and companies have specific challenges that can influence the requirements of sustainability reporting. To some companies, like those selling renewable, low-carbon energy, communicating contributions to sustainability may not be as difficult as to those companies whose business, like mineral extraction, seem incompatible with sustainability.

### **3.5 Sustainable Mining: An Oxymoron?**

#### *3.5.1 A World Dependent on Globalized Mineral Cycles*

A mineral has been defined by Ernest Nickel (1995, p. 23) as “an element or chemical compound that is normally crystalline and that has been formed as a result of geological processes”. Behind this simple definition there are about 3,500 substances that can be categorized in several ways (Casper, 2007). Among the most commonly used categories are the ones shown in Figure 3-5: Metallic (which includes base metals, ferrous, nonferrous, precious metals, and minor metals), non-metallic (sand, gravel, clay, road aggregates and building stones, diamonds, gemstones and energy minerals), metalloids (e.g. arsenic, silicon), alloys (combination of two or more metallic and/or non-metallic minerals). Figure 3-5 distinguishes rocks from mineral resources, mineral reserves, and mineral commodities. A rock can be defined as a combination of two or more minerals. A mineral reserve is a mineral resource whose extraction has been found to be economically and geologically feasible. Mineral commodities correspond to the mineral reserves that are commonly extracted, processed, and commercialized. These commodities underpin “countless” goods and services demanded by society. The publications of Casper (2007) and Ciullo (1996) provide dozens of specific examples.



**Figure 3-5 - Mineral Types**

Minerals have been used since the dawn of human history. Some historians document history according to the predominant minerals and metals used by dominant civilizations. For example, the ages between 100,000 BC and 10,000 BC have been referred to as stone age; between 10,000 BC and 1,000 BC, as copper or bronze age; between 1,000 BC and 1800 AD, as iron age; between 1800 AD and 1950, as steel age (Ashby, 2009). Mining or the extraction of minerals has been, in a sense, one of the most “sustainable” industries that humanity has created. For thousands and thousands of years, it has been enabling and shaping the way humans meet their evolving needs, from the most basic to the most superfluous ones.

In spite of the ubiquity of minerals and metals in modern life, end-users or consumers seldom recognize the number of activities and processes that are involved in their production. The Mineral Cycle includes several steps that go far beyond the simple act of digging minerals out of the ground. Understanding these cycles and their relationships is fundamental for any actor attempting to design sustainability strategies in the sector. Among the most relevant phases are the following:

- **Needs and wants:** Humans depend on minerals to build houses, produce food, garments, and medicine. These “needs” are hardly disputed, especially in highly globalized and industrialized cultures. Nonetheless, humans also “want” mineral-dependent goods like vehicles, jewellery, electronics, among many other goods that have been gradually incorporated into society’s cultures of consumption. The primary



drivers of the mineral cycle are both these “needs” and “wants” Previous publications have referred to these drivers as simply “needs” or “demands” (Atherton & Davies, 2005; MMSD, 2002). However, these terminologies can hide the problem of untamed consumerism and uncritical sense of sufficiency that lies inside the concept of “want” (Princen, 2005).

- **Exploration or prospecting:** This is the phase when geologists locate, test, and prove the existence of exploitable mineral reserves. It involves a number of activities, such as remote sensing, surveying, mapping, drilling, sampling, metallurgical testing, and so forth.
- **Planning:** During the planning stage a variety of players work on the choice of mining and processing methods, the location of the many infrastructures that make up mining and processing facilities, the definition or pre-definition of a plethora of engineering, logistics, maintenance, social and environmental programs. A number of extensive environmental impact assessments are often undertaken in this phase for the purpose of obtaining the necessary licences and permits, as well as for evaluating the economic feasibility of the project.
- **Construction:** This is the phase when the planned activities are made a reality. It usually involves the development of access (e.g. roads, railroads, ports) to the minerals, the elevation of temporary housing and facilities, stripping, tunnelling, shaft sinking, etc.
- **Extraction or mining:** It is finally in the extraction phase that minerals are mined either from surface or underground sites. In this phase there is a continuous process of removal of overburden (material overlaying mineral deposit) often with the help of explosives and large machines. Other activities in this phase include lowering water tables, dumping hazardous and non-hazardous wastes, buying, producing and using energy to run the necessary vehicles and machines, controlling and maintaining the many machines and facilities. A number of subcontractors are also hired to supply a variety of services and materials.
- **Processing:** Processing corresponds to a range of activities such as milling, washing, flotation, grading, concentrating, separating, enriching, treating, and tailings deposition. The type of mineral being produced will determine if and which of these activities will

be necessary. Moreover, there is a variety of technological variations on how these processes are undertaken.

- **Closure:** Unlike renewable resources, the extraction of minerals cannot go on indefinitely. Every mine, regardless of how large its mineral deposits may be, will eventually close. The process of closing a mining site, in modern days, usually starts in the planning phase, extends to the extraction and ends in the “closure” or “reclamation” phase. The latter includes a number of clean-up activities, revegetation, monitoring and, sometimes, reconstitution of the landscape.
- **Smelting and Refining:** This phase refers to a series of metallurgical processes that remove impurities and/or mix mineral(s) and other substances to the product until it meets the buyer’s or market’s specifications. Common procedures involved in this phase include casting, forging, rolling, and moulding. All these activities are actually part of the “processing” phase, but they are often understood as a distinct step, because they may be undertaken by companies other than the ones that extracted and first processed the minerals. As Young and others (2008), have recently shown the location of extraction, smelting, and refining can also vary substantially. For example, while Cobalt is mostly extracted in Africa, its refinement is predominately undertaken in Europe.
- **Trade, manufacturing, and consumption:** After the minerals and metals are “ready” to be commercialized they flow into a variety of value chains (e.g. construction, transportation, electronics, etc.) contributing somehow to virtually every product or structure that enables human civilization. Some mineral commodities (usually the ones with less value-added, like gravel and stone) are traded predominately locally. Most minerals (in terms of variety, not mass) are traded regionally or globally, under complicated and frequently unclear and untraceable routes. Unlike brand-products, mineral commodities lack a “pedigree” or a bar-code. In this context, the end-user cannot always identify where the metal or mineral originated.
- **Recycle, re-use and remanufacturing:** This phase is perhaps the most neglected in the mineral cycle. Descriptions of mining and mineral production phases in the past (e.g. UNEP, 2000, pp. 2-5) used to overlook this phase. After all, as William McDonough and Michael Braungart (2002) have sagely argued in their already classic book, *Cradle*

*to cradle: Remaking the Way We Make Things*, the predominant logic of humanity's productive systems has been one of an "open loop", where products are designed to be dumped in landfills some day. The ecologically-oriented and more sustainable closed loop productive system, dubbed by the authors as "cradle to cradle", is still an abstract principle awaiting wide application. Very few products and value chains today are designed to follow closed loop logic, thus avoiding increasing wastes and emissions in the biosphere. Minerals and metals offer significant opportunities for recycling, reusing and re-incorporation into products, because of their high degree of recyclability. Yet these opportunities have been hampered by cultural, commercial, economic, technical, and technological factors (Ayres, 1997; Henstock, 1996; Tilton, 1999). Most minerals' life cycles remain open loop ones.

- **Disposal:** While disposal has been described as the "last" phase of the mineral cycle (MMSD, 2002, p. 34), it should be more accurately interpreted as an inherent "side-effect" of each phase that makes up mineral production. With the exception of the planning phase, which is essentially an "office" activity, all phases described above involve a certain degree of disposal of minerals and metals on the environment. For example, the overburden removed in the extraction phase carries a significant amount of minerals that, depending on changes in technology and pricing market, may one day constitute a mineral reserve. Another expressive mineral disposal hidden in the mineral cycle are the ones diluted in tailings deposition. Expressive amounts of metals may be diluted in the wastewater flowing to tailing ponds.

The phases above rarely all occur in a specific geographical location, because most nation-states are not self-sufficient in minerals, metals, and related products. Today's mineral market is profoundly globalized, and so are humanity's cultures of mineral consumption. A mining corporation or artisanal miner may extract minerals in North and South America but ship their products to Europe. Another company in Europe may refine that mineral and send it to China, where it will be distributed among a variety of manufacturers, who will in turn incorporate the minerals into their products. These minerals might then be shipped back to Europe, North and South American, but now within manufactured goods, like refrigerators, cars, cell phones, etc. Once used, these goods, including their minerals, may be once again shipped to a different

location (such as Africa) for final disposition in landfills or recycling. This high degree of cyclical trade in the value chains of minerals makes the management of social and environmental impacts a highly challenging one.

### 3.5.2 *Temporal and Spatial Impacts of Mining*

Social and environmental impacts are inherently associated with almost all phases of the mineral cycle, from the very first exploration drill to the final phases of recycling scrap metal and land reclamation. The type and intensity of these impacts vary significantly depending on factors such as type of mineral extracted, mining method, processing technology, site location, political and institutional context. Mining companies are not “legally” responsible for all social and environmental impacts that may arise in the life cycle of its minerals. While some large companies have “voluntarily” begun to make public statements and act on mineral stewardship, eco-efficiency, and recycling (Atherton, 2007; Atherton & Davies, 2005; ICMM, 2006, 2007), the bulk of these companies’ social and environmental efforts focus on the extraction and processing phases. After all, mining companies usually own extracting and processing facilities, thus being directly (and often legally) responsible for their interactions with society and the environment. The impacts of these facilities have been well summarized by Karlheinz Spitz and John Trudinger:

*Mining impacts are many and varied (...) but tend to be local. However, not all impacts are confined to the immediate vicinity of a mine; regional impacts are commonly related to air pollution (dust, smelter emissions), ground water pollution, naturally elevated background levels, and pollution of downstream water bodies and flood plains. Pollution impacts are often long-term, but also can be delayed, as in long-term acid rock drainage, becoming in effect chemical “time bombs”. However, the socio-economic impacts of mining and mine closure in the host country are often of a higher significance than the physical and ecological environmental effects, particularly in the short term and in the political sphere (Spitz & Trudinger, 2009).*

The description above illustrates how complex mining impacts can be, as they may affect the environment at different geographical and temporal scales. The local communities and ecosystems are more directly influenced by the extracting and processing activities, but distant

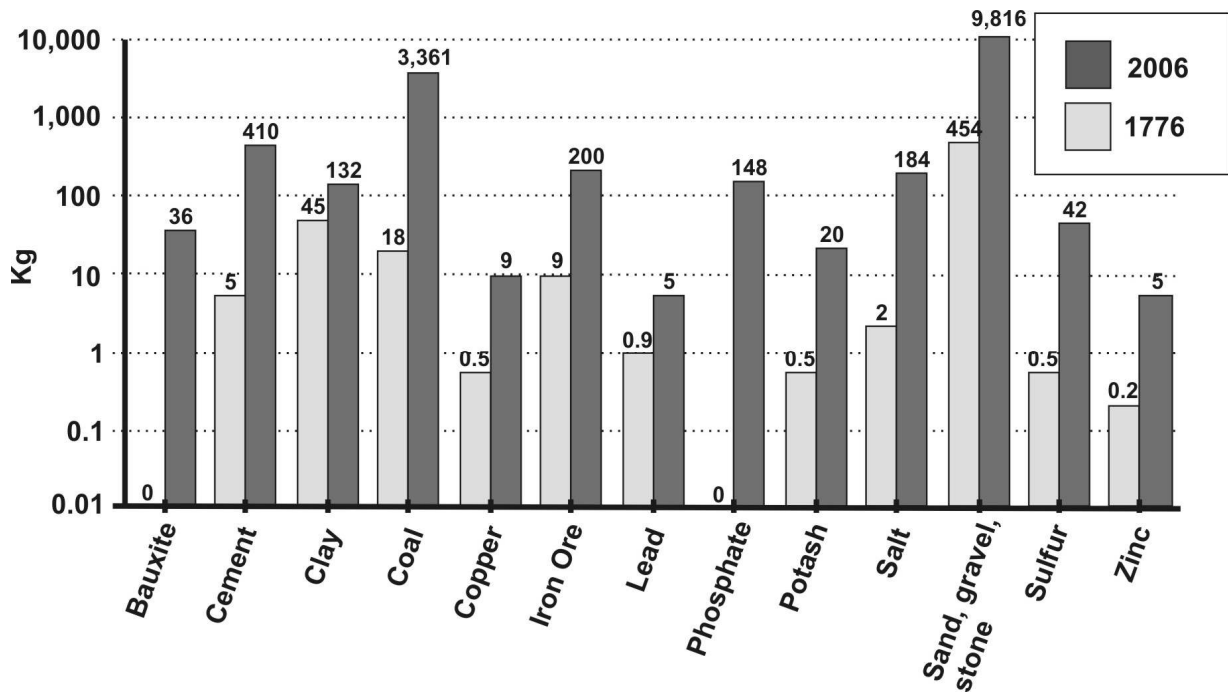
places may be affected by air emissions or by the indirect actions undertaken by third-parties with the money earned from mining's taxes and royalties. The impacts of mining can also accumulate in time and combine with the ones from other industrial agents in the region, thus resulting in incremental or synergistic cumulative effects (Brereton, et al., 2008; Lei, et al., 2009; Therivel, 2004). In addition, the types of social and environmental impacts can be quite numerous. Alex Weaver and Paula Caldwell, in a well-known book chapter, highlighted literally dozens of "common" impacts that may arise in mining projects (Weaver & Caldwell, 1999). These cover a range of social and biophysical categories, such as air, terrestrial habitat and wildlife, hydrology, water quality and quantity, aquatic life, health and safety, community disruption, etc.

It can be challenging to assess the full breadth of the impact of mineral activities. A notable example is mining's influence on the macro-economic performance of countries. Since the 1980s, studies have been showing that countries rich in natural resources tend to have worse macro-economic performance than resource-poor countries. This phenomenon has been called the "resource curse" or "paradox of plenty" and is particularly valid for mineral economies. (Auty, 1993, 1997; Auty & Mikesell, 1998; Gelb & Associates, 1988; Hamilton & Atkinson, 2006; Neary & Wijnbergen, 1986; Neumayer, 2004; Sachs & Warner, 1997, 2001).

While many factors can lead to this "curse" – Humphreys and others (2007) identified eleven – efficient governance is seen as the key one. Given the long timeframe usually necessary to create sound governance, deferral of mineral projects on these grounds has been increasingly debated. Economist Marian Radetzki (1992) argues that, while capital is likely to dissipate abroad or be wasted as a result of lack of appropriate governance, it is the mineral sector that will provide incentives to build up the needed human and institutional resources. Nevertheless, Radetzki's argument awaits empirical evidence.

Another obvious, but relevant and contentious, impact associated with mining is the depletion of mineral resources, which can limit future generation's ability to use minerals. Humanity's demand for minerals grew substantially in the past decades, thus suggesting a potential scarcity of minerals in the future. As opposed to ancient times, when a few metals and construction

minerals were regionally exploited, the current mining industry has an intensive production of a variety of minerals. About 80 mineral commodities are regularly traded in the global economy (USGS, 2008). Figure 3-6 hints at how the demand for minerals has increased in the past centuries.



**Figure 3-6 - Evolution of Annual Per Capita Consumption of Minerals in the US**  
 (Axis Y is in logarithmic scale) Source: Mineral Information Institute (2006) based on data from the former US Bureau of Mines, the USGS, and the Statistical Abstracts of the USA.

Between 1776 and 2006, the annual per capita consumption in the United States of sand, gravel and stone jumped from 454 kg to 9.8 tonnes. Similar boosts happened in the cases of coal, copper, zinc, iron, among others. Moreover, in 1776, some minerals, like bauxite and phosphate were not explored, whereas today they have become an indispensable material of modern life.

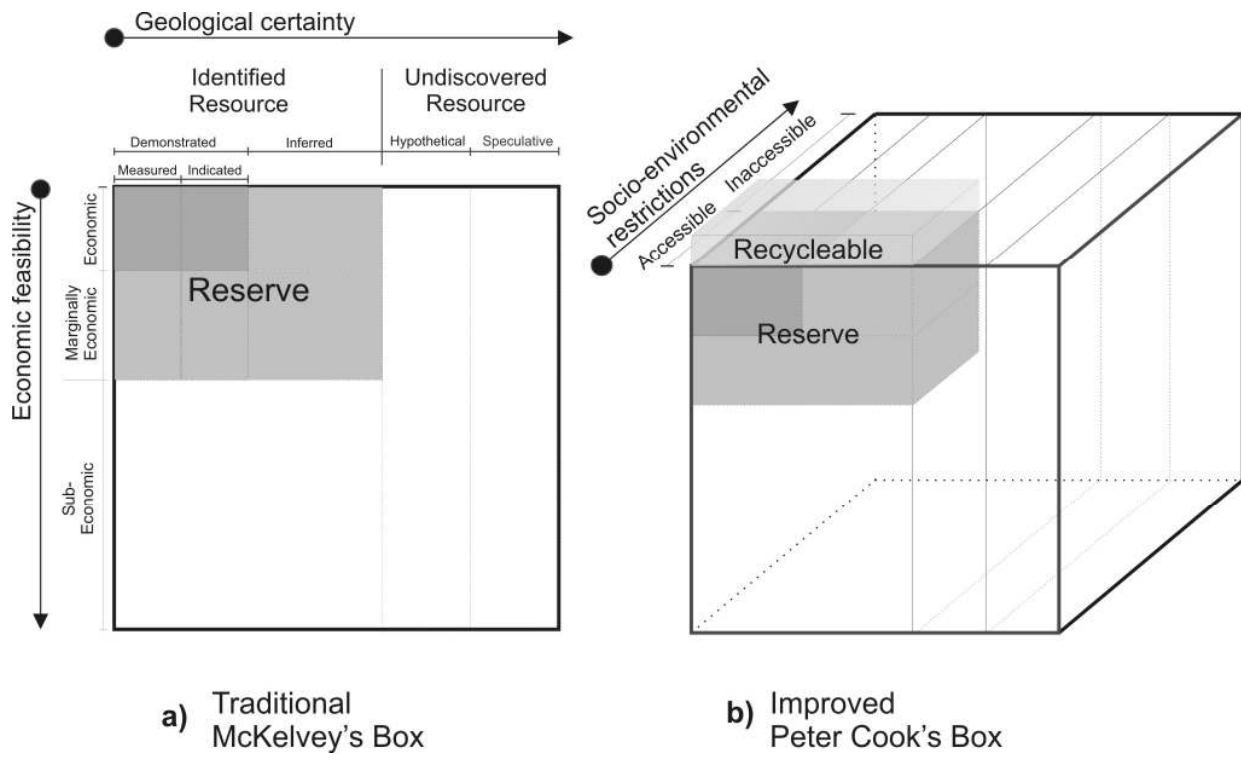
There has been a tremendous growth in humanity's demand for types and volume of minerals. This demand has translated into a multiplication of mining companies and sites. By the end of the twentieth century, Hinde (2000) estimated that there were approximately 10,000 mining companies in the world and some 20,000 mines, processing plants and smelters. Millions of

artisanal miners (Hentschel, et al., 2002), notably in developing countries, complement this mosaic.

The growing demand for minerals coupled with increasing population has led to serious concerns about shortage of non-renewable resources. This concern became a global issue in the second half of the twentieth century, culminating in the publication of the highly influential *Limits to Growth* (Meadows, et al., 1972), which reported the potential scarcity of several minerals in the future. Regardless of the (in)accuracy of the model used in this report – which is occasionally criticized (Beckerman, 2002; Lomborg, 2001; Regist, 2008) – its message contributed to raising awareness about the potential consequences of growing extraction of non-renewable resources.

### 3.5.3 *Non-renewability and Mineral Scarcity*

Debates such as the ones sparked by the *Limits to Growth* report usually refer to minerals that are in high demand by society and whose production, unlike gravel and most building stones, are planned under relatively short life expectancies (in the order of decades). Assessing or modeling the long-term availability of these highly-demanded commodities is rather challenging due to the many uncertainties involved in the determination of reserves. The box that Vincent Ellis McKelvey (1972) created to classify mineral resources – further enhanced by Peter Cook (1997, 1999) – is a strong heuristic device to explore some of these uncertainties (Figure 3-7).



**Figure 3-7 - Uncertainties Involved in the Determination of Mineral Reserves**  
 Source: Adapted from Cook (1997, 1999) and McKelvey (1972)

The box in Figure 3-7-a shows that a mineral resource only becomes an economically exploitable “reserve” when certain degrees of geological certainty and economic feasibility have been met. Almost two decades after McKelvey presented his box, Peter Cook enhanced his work by showing that, in addition to geological and economic factors, there are a number of social (political, regulatory, technological, etc.) and environmental issues that influence the identification, recyclability, and exploitation of minerals. Figure 3-7-b shows Cook’s point by adding a third axis of socio-environmental restrictions as well as an above-ground stock of recyclable minerals to the potential reserves.

The world’s demand for, and availability of, mineral commodities varies substantially. Sand and gravel, for example, are so abundant in the Earth’s crust that they are virtually “free”. Their market value is usually associated with the costs of transportation and extraction. Concerns about exhaustion of these minerals can only make sense at an extremely local level. Furthermore, the extent to which each mineral can be recycled and remanufactured depends on



the nature of the commodity. While anthracite (hard coal) can be processed once, for example, gold, aluminum, and copper allow for countless recycling cycles.

The quantity of certain renewable resources, like forests, may be easily quantifiable through methods like satellite imaging. However, the determination of how much of the world's mineral resources can be extracted often depends on the many geological, technological, economic, social, and environmental factors represented in Cook's Box. Since the determination of these factors can be very costly, the pace at which mineral reserves are proven and measured is partially dependent on society's demand for minerals and numerous other factors. The long-term availability of minerals is inherently uncertain. Not surprisingly, debates about mineral scarcity may get contentious and polarized.

A professor of resource economics, John Tilton, identified two opposing paradigms - the "fixed stock" and the "opportunity cost" - when examining the mineral scarcity problem (Tilton, 1996). Members of the former recognize that technology and market mechanisms can lead to positive increases in mineral reserves, but argue that these do not outweigh the rising demands for minerals resulting from growing population and consumption patterns. Thus mineral scarcity is an inevitable outcome. The aforementioned report *Limits to Growth* is a notable example of this view. Members of the "opportunity cost" paradigm, such as Barnett and Morse (1963), have a rather different view. Within this group, technology, recycling, substitution, and market mechanisms are believed to offset the lessening availability of minerals. Members of this paradigm argue that financial resources for exploration will become scarce before minerals themselves.

Tilton's paradigms, however, refer to mineral scarcity in the biosphere at the global level. At national and local scales, risks of mineral exhaustion are more tangible. Potentially profitable mineral endowment locations are determined by special geological conditions. While global mineral endowments may not be exhausted from the Earth any time soon, they might become scarce in particular geological systems. Within these systems, the timing of extractions is a serious concern for governments and their security-focused, growth-driven, short-term planning timeframes.

Mathematician Harold Hotelling, in the now classic *The Economics of Exhaustible Resources* (Hotelling, 1931), argued that price of unexplored mineral resources rises at the rate of interest. Therefore, mining companies or governments have the option of extracting reserves following discoveries, or holding the mineral in the ground to realize more gains from increases in its value due to growing scarcity. This often debated argument justifies the postponement of exploitation, but does not necessarily promote intergenerational equity or sustainable development (Auty & Mikesell, 1998, p. 51). According to Auty and Mikesell, long-term well-being and sustainable ecological functioning may actually result from mineral exploitation, depending on how it is done and how profits are shared.

It was not until John M. Hartwick's 1977 article in the *American Economic Review* that the intergenerational equity imperative found an influential theory in mineral economics. Hartwick argued that if society invested all rents from exhaustible resources in reproducible capital goods, then consumption would remain constant over time (Hartwick, 1977, p. 972). At the core of this argument, known as Hartwick's Rule, is the theory that substitutions among natural and human-made capitals are acceptable between generations. This position, which had already been supported by others (Solow, 1974; Stiglitz, 1974), became years later known as the "weak" version of sustainability. Under this version, sustainability requires that the overall stock of the various types of capital should remain constant over time (Turner, 1992, p. 09). The "strong" version, in contrast, recognizes interdependencies between human-made and natural capitals as well as uncertainties about ecosystem functioning. Within the strong version, substitutability has limits: some natural capitals (critical ones) must be preserved and constantly monitored.<sup>16</sup> In the next chapter, in section 4.2.6, additional information will be provided on this debate about substitutability of natural and man-made capitals.

It is important to note that Tilton, Hotelling and Hartwick are mostly concerned with the sustainability of the world's mineral supplies. While addressing the maintenance of mineral commodities and economic development over time, these authors overlook the sustainability of

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<sup>16</sup> These two conflicting views have been increasingly debated in the field of ecological economics since the early 1900s. To date, the weaker version seems to have captured more critics than supporters (Ayres, et al., 1998; Beckerman, 1995; Daly, et al., 1995; Ekins, et al., 2003; Gutés, 1996; Neumayer, 2003).

the “ecosystems” supporting mineral supply. In the last century, the discipline of mineral economics has been successful in increasing minerals reserves and boosting economic growth. Nevertheless, these achievements came at the cost of ecosystem services and natural resource amenities, which have become more scarce and clearly noticeable on the ground (Krautkraemer, 2005).

The depletion of mineral reserves, in the eyes of governments and communities hosting mining operations, cannot be offset but only attenuated by technological improvements, substitution, recycling or community investments. At the local scale and local timeframe, the Hartwick Rule is not an alternative, but a hope. After all, this rule is not explicit as to whether substitution of capital will take place at the mining region or elsewhere (Sinha, et al., 2007, p. 58). In the few years or decades of a particular mining operation, minerals will be “shipped” to different cities, regions or countries. In some cases, this flow will be substituted for jobs, services, manufactured goods that translate into lasting and increased well-being for local communities. History, however, has been showing several opposing cases (Squires, 2008; Veiga, et al., 2001). Renewable resources will also be depleted to enable extraction and respective services. And it could take generations for damaged ecosystems to regain health, despite the tremendous progress that there has been in mine reclamation effectiveness. The magnitude of this phenomenon will, of course, depend on the scale and type of mining endeavour. But its demise will eventually come, potentially resulting in job loss and cultural and economic disturbances if the revenues from mining are not appropriately invested.

As the following chapter discusses, a systemic, holistic view is a fundamental requirement in any analysis of mining and sustainability. Focusing on the problem of mineral scarcity without considering how it is related to the sustainability of the overall system can be disastrous. Accordingly, assessments of mineral sustainability at the biosphere must be accompanied by assessments of the sustainability of local systems hosting mining operations, and vice versa.

### 3.5.4 *The Eternal Criticism of Mining*

Mining depletes, processes, and relocates mineral resources while profoundly changing landscapes and socio-economic patterns of affected countries and communities. These changes are usually “accepted” by society because of minerals’ and metals’ many benefits. Yet these changes have also been an old target of harsh criticism. The ancient Roman author *Pliny the Elder*, while acknowledging the great benefits of minerals, remarked that “we quarry them for a mere whim... But least of all do we search for means of healing; for how few in their digging are inspired by the desire of cure” (Hughes, 1996, p. 112). Georgius Agricola, who wrote the famous book *De re Metallica* (originally published in 1556), pointed out that some medieval villagers realized that “there is greater detriment from mining than the value of the metals which the mining produces” (1912, p. 8).

It was not until the mid-late 1900s, however, that the magnitude of these anti-mining<sup>17</sup> criticisms reached global levels. The number of tailing dams’ accidents increased substantially during this period. Usually a result of managerial and technical failures (UNEP/DTIE/ICOLD, 2001), these accidents raised question-marks about the social and environmental responsibility of mining companies. A number of other impacts, such as community disruption, human rights abuses, air pollution, and acid mine drainage, also intensified with the world’s growing demand for minerals.

These problems stimulated the emergence of a variety of NGO campaigns targeting mining issues. World-renowned “environmental” organizations, like *Greenpeace*, *Friends of the Earth*, *Global Witness*, *Earthworks*, *Oxfam America*, among many others, have included mining in their agenda (Conservation International, 2010; Earthworks, 2007, 2010; Global Witness, 2010; Greenpeace, 2010; Macdonald & Rowland, 2002; Power, 2002; Ross, 2001; WWF, 2007). Among the most recent and widely publicized global anti-mining campaign is *No Dirty*

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<sup>17</sup> The term “anti-mining” is used in this thesis, as in the majority of works elsewhere, to qualify initiatives or groups that contest “how” mining is done, not “if” mining should exist. This term usually refers to initiatives that challenge who should be involved in decision-making, who should benefit from mining, which ecosystems should be disturbed, etc. As Andy Whitmore (2006) remarked, even “miners” (usually artisanal or small-scale ones) adopt this term to challenge large mining corporations’ practices.

*Gold* (Earthworks, 2007; Farrell, et al., 2004; No Dirty Gold, 2010). Its online reports and multimedia material have been drawing the attention of the media, industry and academia (Ali, 2006; ICMM, 2004, 2008a; Sarin, 2006).

These global initiatives represent just a fraction of the number of civil society groups concerned with mining's role in sustainable development. Similar efforts, but smaller, local ones, are constantly being undertaken by community organizations and associations worldwide, especially indigenous ones (Ali, 2003; Blaser, et al., 2004). Eventually these efforts escalate to armed conflicts, thus being conceptualized as "resource wars" (Billon, 2005; Gedicks, 1994). Among the most conflict-intense mining regions today are the ones situated in the Democratic Republic of Congo. This country's vast mineral wealth has been driving a series of human rights problems, environmental degradation, corruption, and armed disputes (Garrett & Mitchell, 2009; Hayes & Burge, 2003; PACT, 2008).

The epicentre of conflicts in the past was usually situated between mining companies and governments, but this situation has changed. "The conventional binary contest between states and corporations over the benefits and impacts of mining has been widened to incorporate the representations of local communities, and broad but unstable mining communities now coalesce around individual projects" (Ballard & Banks, 2003, p. 287) .

The thematic foci of the aforementioned campaigns and conflicts can be as diverse as the impacts of mining in society and the environment. Nonetheless, a number of issues are commonly found in the discourses of the civil society associations. The *London Declaration* hints at the main ones. This declaration was signed by 24 representatives of worldwide groups and communities affected by mining who met in London in 2001 to "assess the impacts of mining on the lives of communities and ecosystems, and to share strategies in confronting the industry's unacceptable policies and practices" (Mines and Communities, 2008, 2nd paragraph). The signatories demanded a number of actions from governments, companies, financial organizations and other actors. Their demands cover some of the most contentious issues in mining:

- Community and indigenous rights;
- Eco-efficiency of extracting operations;
- Intergenerational equity;
- Mine reclamation, and landscape impact;
- Role of financial institutions in promoting irresponsible mining projects; and
- Growing impacts of large-scale mining enterprises in developing countries.

Civil society associations have traditionally been the main sources of anti-mining activism, but filmmakers are increasingly aiming their lenses at mining stories, thus contributing to raise public awareness of the industry's negative side. Numerous movies (mostly documentaries) addressing the impacts of mining have been produced in the past decade or so (e.g. Baljak, 2007; Bernstein & Slick, 2008; Cavadini & King, 2001; Henkel, 1999; D. Jones, 2009; Kocsis, 2004; Looker, 2008; McAller & McElhinney, 2006; Revenga, 2005; Rotheroe, 2000; Sharman, 2006; Thornton, 2005). One of the most recent ones, the science fiction *Avatar* (Cameron, 2009), has already become one of history's most profitable and successful movies (Cieply, 2009), thus helping to reinforce anti-mining sentiment among global audiences. The film's plot has at its core the impacts of a mining company on the territory of a native community living in a fictional planet called *Pandora*. Interestingly, a group of "real" indigenous leaders from Ecuador, months after the movie was released, watched the movie under the lenses of journalists and reporters to promote a sort of public relations stunt drawing attention to the their own land rights problems (PRI, 2010).

All these movies, NGO campaigns, conflicts, and other forms of anti-mining activism have an inevitable outcome: damage to the mining industry's ethical reputation. The print and online press are constantly covering these anti-mining manifestations, thus helping to portray mining as a controversial activity. Very often, this problem of reputation falls under major mining corporations, as these powerful entities have been playing growing roles in the sector, accounting for the overall majority of the world's mineral production.

Reputation is an abstract phenomenon, but it can and has been translated into more tangible indexes. For example, a company from Switzerland, Covalence SA, has been tracking the ethical reputation of multinationals by sourcing information from the media, civil society, and

companies. Covalence created an EthicalQuote curve, which aggregates thousands of positive and negative news items gathered from various online sources. Among the 18 investigated sectors is “Basic Resources”, which encompasses 32 mining and metals multinationals (Covalence, 2009a). In the latest EthicaQuote, Basic Resources was ranked 17<sup>th</sup> out of 18 other sectors. As Covalence’s Press Release explains:

*Basic Resources remains an ethically exposed sector. Critical observers have acknowledged the progresses that were made and have adapted and, for some, renewed their political scope. As companies respond to critics through various commitments, NGOs adapt to this change: recognize progress, consider partnerships, question their own conceptions, set up new campaigns. Negative news pushes companies to generate positive news, which in turn push critics to reformulate their ethical demands, etc. Basic Resources companies present sensibly less positive news in criteria group Impact of Product compared to the all-sectors benchmark. It is difficult for metal companies to demonstrate the social and environmental end value of their products. The challenge seems even greater for mining companies: what is the utility of gold and diamonds for society? What are their benefits for the environment? (Covalence, 2009b, 5<sup>th</sup> paragraph)*

One of the most contentious issues fuelling this reputational problem is the fact that mining companies extract non-renewable resources. Institutions and people easily agree that the social and environmental impacts of extraction need to be harnessed through eco-efficiency, community investments, equitable allocation of mineral rents, and so forth. But consensus as to how to make the extraction of non-renewable resources compatible with sustainability is far from reach. The finite nature of minerals puzzles advocates of sustainable development. Many people and organizations see the nature of the mining industry as an unsustainable one. The opening sentences of a letter signed by many NGOs in reaction to an industry-led “mining sustainability” initiative known as MMSD (which will be described in the next section) epitomize this view:

*Mining is inherently unsustainable - it requires the depletion of non-renewable natural and cultural resources. In many cases, mines can be operated more responsibly, with reduced negative impacts. But a truly sustainable global society will take fewer minerals from the earth each year. Instead of requiring ever-growing amounts of minerals and fuels, a sustainable economy will use materials more efficiently, reduce waste to a bare minimum, and rely more on recycling, reuse, and renewable energy. (Young & Septoff, 2002, p. 1)*

Generalizations like the one above are rhetorically strong, but factually contentious. There are a number of issues and uncertainties involved in the extraction of minerals that call for contextual, value-laden, yet careful considerations about the long-term viability of mining. Two of the corporate executives interviewed for this thesis, of course, are fully aware of mining's apparent incompatibility with sustainable development. They believe that the industry should avoid using the term "sustainable", in favour of the more neutral "responsible". As one of them explains:

*Let me address the issue of responsibility versus sustainability. Sustainability in the context of a mining company – because of what we are doing, we are not mining a renewable resource– the normal definition of sustainability is difficult to apply. And, for that reason, we prefer the word responsibility, because we can define responsibility in a way that our overall contribution during our life of mine is something that is going to persist long after the activities are done in a positive way. That isn't to say that there isn't negative impacts, some people would consider any impact to the landscape to be a negative impact. And we are not restoring the contour of the land, nor we are able to restore the ecosystem to the same succession level as we might have accounted when we began our mining operations. So, there are certain impacts and we admit those impacts, but we believe that if you will sort of weight the positive impacts and the negative impacts, the positive would outlay the negatives in a very substantial way.*  
(MP-1)

The executive's argument that the industry should avoid the sustainability concept is an exception nowadays. In reaction to their damaged reputation and to the many sources of criticisms discussed above, mining corporations have been increasingly using the rhetoric of sustainable development, trying to make the business case for a "sustainable mining corporation".



## 3.6 Mining Corporations' Responses to Sustainability

### 3.6.1 *Taming the "Trojan Horse"*

The key players of the mineral sector in the past included "governments, a few companies licensed to extract minerals, and a few recognized traditional groups living in or near mineral reserves" (MMSD, 2002, p. 58). Today's sector, however, encompasses a diverse range of players, from the very local to the international level. Among the most important ones are the following:

- **Industry:** This group of players includes the institutions that are involved in the exploration, extraction, processing, and trade of minerals. At its centre are large, medium, and small/junior mining companies, as well as artisanal miners. Other players include traders, recyclers, industry associations, labour associations and unions.
- **Governments:** National/federal governments (and to a lesser extent, provincial/state and local governments) are responsible for the creation and implementation of the regulatory, political and administrative framework for mineral exploitation. A variety of governmental agencies and departments grant exploration, mining, and environmental permits and licences. Moreover, governments are responsible for investing portions of the revenues from mining.
- **Environmental NGOs:** These include some actors involved in the criticisms discussed in the previous section. NGOs have predominately assumed confrontational roles, while promoting activism and public awareness. However, recent years have seen a number of NGOs partnering with mining companies and related associations seeking more collaborative strategies to address mining's problems.
- **Local Communities and Indigenous Groups:** This grouping usually refers to those urban or rural communities (including aboriginal and indigenous people) that are affected by mining. These players are the ones who most immediately react to mining projects. Not surprisingly, they have been increasingly consulted in proposed exploration and mining projects, voluntarily or in response to mandatory requirements.

Their “informed consent” is fundamental to the implementation and stability of mining operations (Environmental Law Institute, 2003; Macintyre, 2007; Martin, 2007).

- **Financial Constituencies:** Shareholders, investors, and financial institutions play an important role in the mineral sector, as they provide the financial means for exploration and extraction worldwide. Mining and exploration companies have been increasingly opening their “financial shares” to be traded in the stock market. In addition to individual shares, there are today a variety of funds and other collective investment instruments with mining and metal’s shares in their portfolio. Investors are among the most important players pushing for sustainability reporting today, as sustainability issues pose risks to their investments. Other relevant actors in this group include the World Bank and the International Finance Corporation, which promote private mining investment in developing countries.
- **Consumers:** Consumers are those individuals and institutions that use minerals and metals. They may include not only users at the end of the mineral cycle (usually referred to as “end-users”), but also entities, such as manufacturing companies, that buy minerals and metals to be incorporated into their products. Individuals are the main drivers of mining, but seldom realize so, because the products of mining are often “hidden” in other products, such as cars, furniture, and electronics. However, recent years have started to witness some campaigns pushing for some sort of “metal-conscious” consumerism. Among the most notable examples is the *makeITfair* campaign, which is pressuring brand electronic companies to source metals from conflict-free regions (Young, et al., 2010).

Each of the actors above has a role to play in the promotion of sustainable development. Nonetheless, some players, because of their superior financial and political power, are believed to have greater responsibilities. That is the case of governments, who are responsible for setting up the “rules of the game”, that is, defining when, where, and how exploration and mining should take place in their jurisdiction. Governmental policies and institutions concerning natural resources use can dramatically influence mineral development.

After governments, major mining corporations are arguably the most relevant players in the sector. These increasingly powerful institutions are directly involved in the extraction and processing of minerals, as well as in the implementation of dozens of social and environmental programs. Moreover, large companies are responsible for the overall majority of the world's mining production (UNCTAD, 2007).

The terminology surrounding the expression “large mining company” is confusing. Different terms, such as “major”, “giant”, “global”, “multinational”, and “transnational” are combined with “company”, “firm”, “enterprise”, and “corporation” to describe the world's largest mining companies<sup>18</sup>. The criteria used to differentiate large from non-large ones are arbitrary. They may be based on market capitalization, mineral production, revenue or other criteria. These terms are frequently combined to refer to large publicly traded corporations with operations in multiple countries, but large state-owned and closely-held mining enterprises may also fall into the category of “large”.

Furthermore, because many of these companies produce a diversified portfolio of minerals and refined/smelted metals, they may be named as “mining and metal” companies. In addition to minerals and metals, some corporations extract coal, gas and oil, thus being representatives of both the mining and energy sectors. To avoid confusion, sometimes the term “non-fuel” is used to qualify some types of companies and productions.

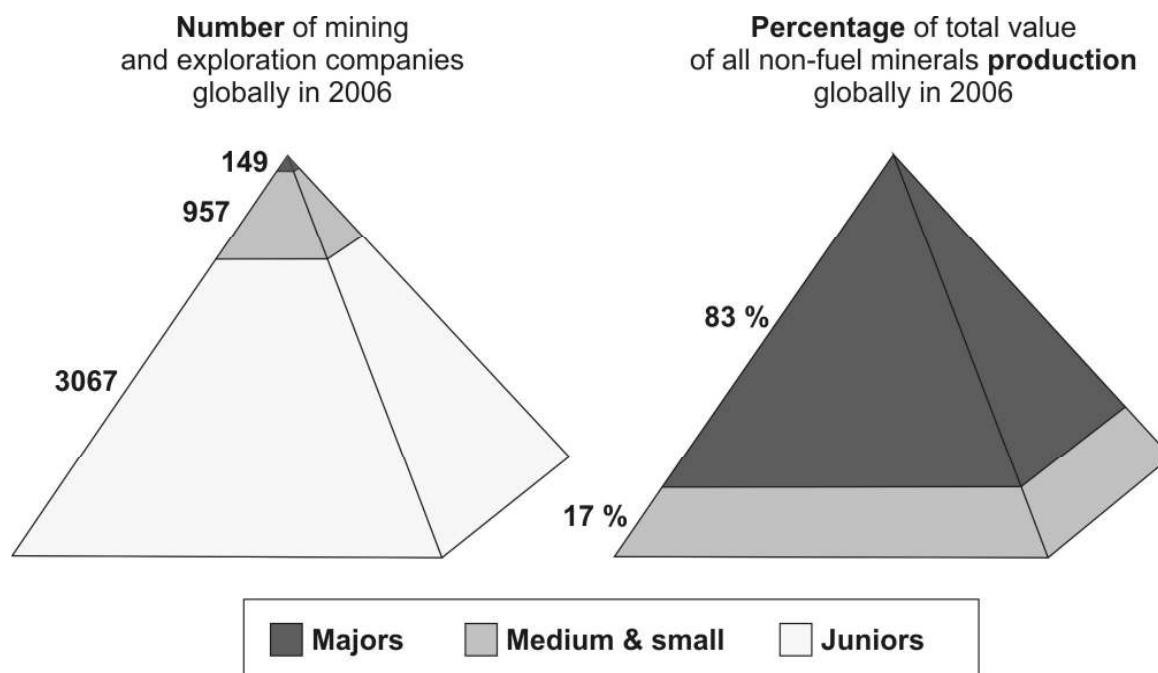
In such a complicated terminological context, statistics and ranks of large mining companies need to be carefully considered, as they reflect the interpretations of particular authors and institutions. One of the most influential institutions providing statistics on the world's mining

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<sup>18</sup> There have been many studies about the evolving definitions of company, corporation, multinational corporation (MNC), and transnational corporation (TNC) (Drucker, 1993; Forsgren, 2008; Markusen, 2002; Mucchielli & Mayer, 2004; Robins, 2006). While these terms are often used interchangeably, they may be differentiated as follows: 1) Company is a general form of business organization and can be used to refer to corporations, associations, unions, among others. 2) A corporation is an institution that was legally authorized to act as an individual, thus having its own rights and liabilities. Corporations can be very small, but the term is often used to describe “large” companies, especially those topping the Fortune's and Financial Times' ranks of largest companies. 3) A MNC is a corporation with operations in multiple countries, but with its head office based in a specific country. The term MNC includes small business entities, but is usually associated with large ones. 4) TNC is a corporation with operations in multiple countries, but whose control is not centralized in a specific country, thus “transcending” national borders. The press and dictionaries frequently treat MNCs and TNCs as synonymous.

production is the Sweden-based Raw Materials Group (RMG). RMG’s economists and policy analysts are often speakers at notable mining events, such as the *World Mines Ministries Forum* and the annual *Prospector & Developer Association (PDAC) Convention*. For years, RMG’s data have been showing that, although the total number of mining companies remains in the thousands, the world’s production has been increasingly concentrating “in the hands” of major players. One of RMG’s latest statistics, illustrated in Figure 3-8, shows that, while there were 4,173 mining and exploration companies operating in 2006, the major 149 companies were responsible for 83% of the world’s non-fuel mineral production. Most impressively, the largest 10 companies accounted for roughly a third of the world production (Ericsson, 2008). As RMG’s director and co-founder, Magnus Ericsson, explains:

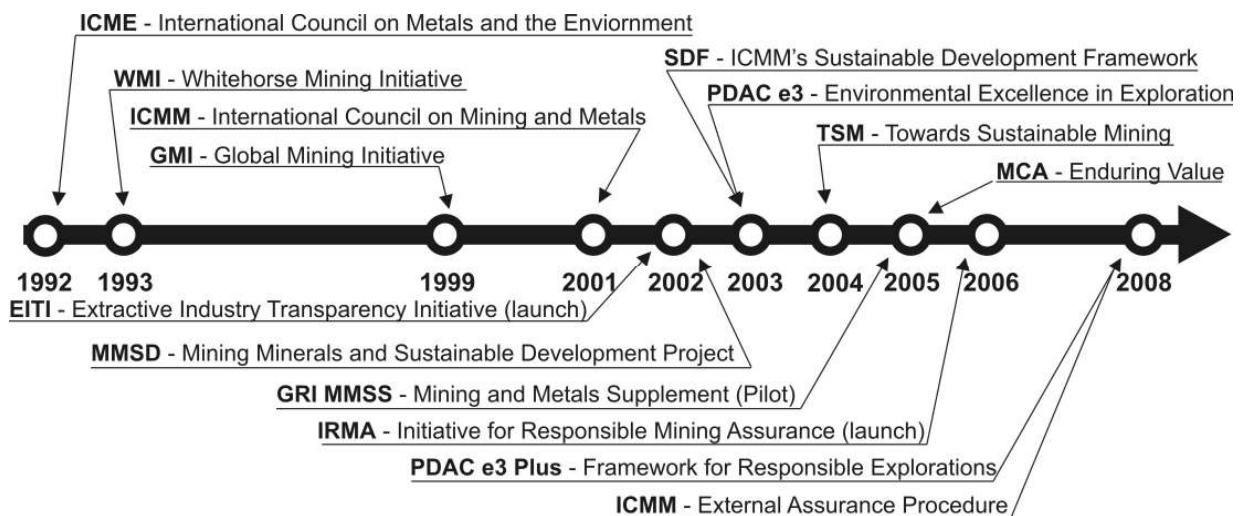
*(...) the industry is getting more and more polarised, to the one side there are the large, established mining TNCs controlling a major share of global metal production and on the other side are the junior exploration companies without any production, only “blue sky” hopes of future production. There is a lack of medium and small sized producers, which can grow organically and become major producers with time. These companies are important in that they concentrate on smaller deposits which often have good grades but which are discarded by the majors.* (Ericsson, 2008, pp. 113-114)



**Figure 3-8 - Number and Value of Production from Mining Companies in 2006**  
Source: Adapted from Ericsson (2008).

The major companies described by Ericsson are the ones who are usually targeted by anti-mining campaigns and pressured to behave sustainably. This pressure has been triggering reactions from large mining companies for at least two decades. The early 1990s witnessed one of the first and most comprehensive efforts of that kind trying to “match” mining and sustainable development: the Whitehorse Mining Initiative (WMI) (McAllister & Alexander, 1997). The WMI was spearheaded by the Mining Association of Canada (MAC), whose members included some of the world’s largest mining companies at the time. Since then several other industry-led or supported sustainability initiatives have emerged.

As Figure 3-9 suggests, this process became particularly noticeable after 1999. The turn of the 20<sup>th</sup> century marked the beginning of one of the most intense periods of change in the corporate culture of mining organizations.



**Figure 3-9 - Timeline of Industry Sustainability Initiatives in the Mining Sector**

Jim Cooney, former executive of Corporate Affairs at Placer Dome<sup>19</sup> and a frequent keynote speaker in mining events, described that period as a “radical transformation” that is still unfolding:

<sup>19</sup> Placer Dome was a Canadian-based large mining company that was purchased by Barrick Gold (the world’s largest gold mining company) in 2006.

*Leading international mining companies have fundamentally changed their understanding not only of the social and political context in which they operate but also of themselves. Corporate priorities are different; corporate values have evolved; and corporations have changed the way they build and operate mines. In fact, so dramatic has been this transformation that we can correctly call it a revolution* (Cooney, 2004, p. 6)

Some of the initiatives highlighted in Figure 3-9 emerged amidst heated debates concerning mining and sustainability. Cooney, who witnessed many “backstage” discussions, said that, at first, mining executives were afraid that those initiatives could create a “(...) Trojan Horse that would bring the enemy within the camp and weaken the mining industry’s ability to fight its adversaries” (Cooney, 2004, p. 6). But such views became the exception. Powerful senior leaders from large mining companies gradually agreed with the integration of sustainability into their rhetoric and strategies, thus pressuring other executives to do so.

The most relevant initiative from that period – and arguably the largest ever created in the sector – was the Global Mining Initiative (GMI) (Young, 2005). The GMI was championed in 1998 by nine CEOs from large mining and metal companies, who met at the Annual Meeting of the World Economic Forum and formally agreed to proceed with a process that became known as the GMI. At the core of the initiative was the Mining, Minerals and Sustainable Development (MMSD) project, which gathered over 150 individuals and organizations to understand the role that the sector could play in sustainable development. Despite several challenges (Danielson, 2006), the project resulted in the publication of important reports, including the landmark *Breaking New Ground* (MMSD, 2002a). Another major outcome of the GMI was the creation, in 2001, of the International Council on Mining and Metals (ICMM), a global industry organization that has been representing and helping many of the world’s largest mining and metal companies in sustainability-related issues.

ICMM is currently made up of 19 companies and 30 national mining and mineral commodity associations (ICMM, 2010b). The council vision is of a “(...) respected mining and metals industry that is widely recognized as essential for society and as a key contributor to sustainable development.” (ICMM, 2010a) Among its most important programs is the

Sustainable Development Framework (SDF), which encompasses a set of ten principles, sustainability reporting, and external assurance (Figure 3-10). All member companies are expected to implement the SDF and thus publish independently verified reports on their sustainability performance. At the core of the framework is a requirement for the use of the Global Reporting Initiative framework and its Mining and Metals Sector Supplement (MMSS). To foster comparable external verification, the Council recently launched an Assurance Procedure (ICMM, 2008b), whose contents and potential implications will be further analyzed in Chapter Five.



**Figure 3-10 - ICMM Sustainable Development Framework**  
 Source: Adapted from ICMM (2010c)

In less than a decade, ICMM has become one of the most influential organizations in the realm of mining and sustainable development. Its evolving programs, including the SDF, are being implemented by 19 of the world’s largest mining companies, and promoted by 30 mining and mineral commodity associations. Although not as visible as member companies, these associations indirectly represent hundreds of mining and metal companies worldwide, thus helping to infiltrate ICMM programs through non-large entities. The World Gold Council (WGC) and its members, for example, have recently made a public statement endorsing ICMM principles (WGC, 2010). Another example is found in the changing policies of the Minerals Council of Australia (MCA). The MCA used to have a unique code of conduct until 2005, when it was replaced by the SDF-based *Enduring Value* (Figure 3-9). According to the MCA, “[a]lignment between a range of key industry initiatives is critical to ensuring the successful implementation of sustainable development across the mineral sector” (MCA, 2005, p. 4).

ICMM and the many initiatives highlighted in Figure 3-9 provide undisputed evidence that sustainability has transformed from menace to symbolic vision in the mining industry. The concept was recently ranked by Deloitte as one of the top 10 issues in the mining sector (Deloitte, 2010). However, as Deloitte's report suggests, the debate today is less about *whether* mining should contribute to sustainability, and more about *how* to make it happen.

*Until recently, however, many businesses approached sustainability as a public relations issue. In an environment characterized by the need to innovate, gain operational efficiencies and reduce enterprise costs, this is no longer a feasible stance. This is particularly true in the face of heightened regulation, more vocal investor activism and changing consumer expectations. There was a time when the mining sector could confine its sustainability activities to narrowly defined areas, such as worker safety and energy management. That time has now passed. (Deloitte, 2010, p. 6)*

### 3.6.2 Sustainability Reporting: Rhetoric or Reality?

Partly driven by ICMM and by a global corporate governance trend described in Section 3.4, large mining corporations have been increasingly publishing sustainability reports. According to KPMG's latest *Global Mining Reporting Survey* (KPMG, 2006b), 40 out of the world's 44 major global mining companies were disclosing sustainability performance. Most of these disclosures are being published in standalone reports based on the GRI framework (Deloitte, 2007). According to GRI, 81 reports (see Figure 3-11 further below) from the mining and metals sector were formally based on the GRI G3 in 2009 (GRI, 2010c).

The websites of the world's largest 20 mining companies (

Table 3-2) confirm these numbers and reveal how sustainability has infiltrated corporate culture. Seven out of the ten largest companies mention sustainability in their missions, values or strategies.



**Table 3-2 - World's 20 Largest Mining Companies in 2007-2008**

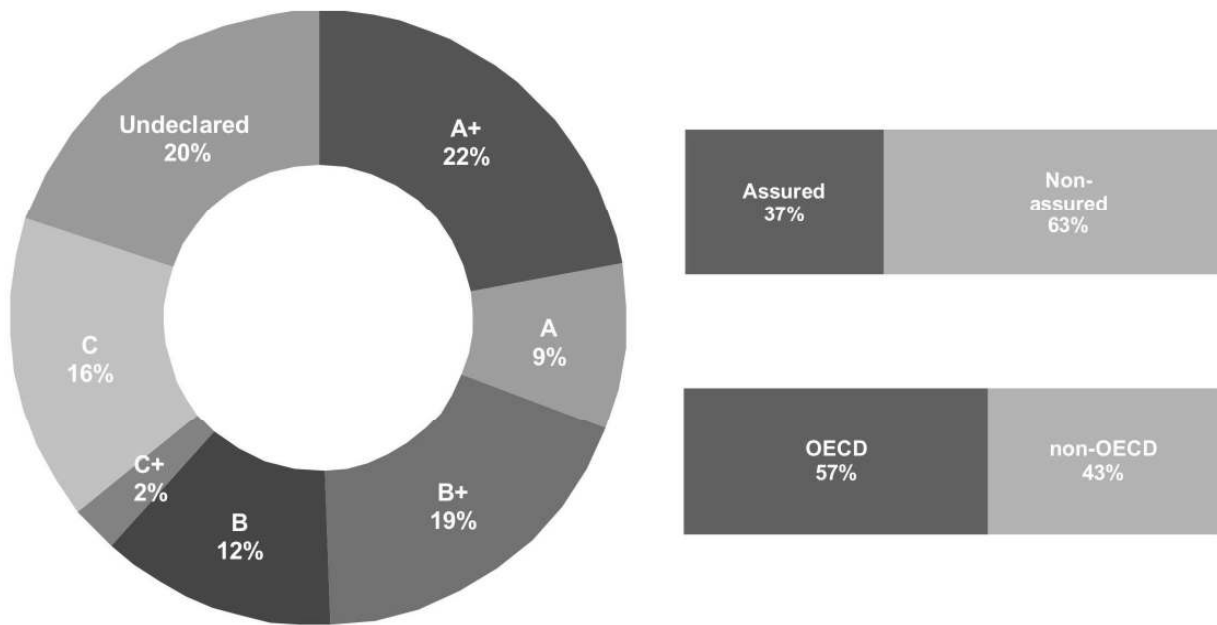
Rank	Company	Country	Market Value \$million	Employees	Company-wide Sustainability Report	GRI-based	Operational Units Sustainability Reports	Sustainability Menu on Main Website	Sustainability Policies	Sustainability in Mission, Value or Strategy
1	BHP Billiton	Austra./UK	118,221.70	41,732	✓	✓	✓	✓	✓	✓
2	Vale	Brazil	68,351.30	62,490	✓	✓	✓	✓	✓	✓
3	China Shenhua Energy	China	57,610.70	59,543	✓*			✓	✓	✓
4	Rio Tinto	Austra./UK	51,590.60	105,785	✓	✓	✓	✓	✓	✓
5	Barrick Gold	Canada	28,308.40	20,000	✓*	✓	✓			
6	Goldcorp	Canada	24,611.70	2,719	✓	✓	✓		✓	
7	Anglo American	UK	22,379.70	105,000	✓	✓	✓	✓	✓	✓
8	Newmont Mining	US	21,418.00	15,450	✓	✓		✓		
9	Xstrata	UK	19,622.30	40,049	✓	✓	✓	✓	✓	✓
10	Zijin Mining Group	China	19,612.10	19,034						
11	Aluminum Corp.of China	China	16,803.10	107,887						
12	Freeport-Mcmoran C&G	US	15,688.70	29,300	✓	✓	✓	✓		
13	Southern Copper	US	14,873.60	11,494						✓
14	China Coal Energy	China	14,655.80	50,805						
15	Anglogold Ashanti	South Africa	12,844.40	62,895	✓	✓	✓			✓
16	Kinross Gold	Canada	12,557.80	5,500	✓	✓				
17	Siderurgica Nacional	Brazil	12,016.30	13,971	✓					
18	MMC Norilsk Nickel	Russia	11,635.90	87,494	✓*	✓		✓		✓
19	Newcrest Mining	Australia	11,001.90	-	✓	✓		✓		✓
20	Impala Platinum	South Africa	10,509.70	34,364	✓	✓				✓
<b>Total (percentage)</b>					<b>80%</b>	<b>70%</b>	<b>45%</b>	<b>50%</b>	<b>35%</b>	<b>55%</b>

\* Used the term “responsibility”, as opposed to sustainability.

Source: The financial, geographical, and employee information were drawn from Financial Times' 2009 list of the largest 500 publicly traded companies (Financial Times, 2009). The remainder was based on a content analysis of each company's websites, undertaken on August 27, 2009.

The growing publication of sustainability reports in the mining sector has been driving the attention of scholars, whose analytical approach to this phenomenon has been predominately descriptive (Guenther, et al., 2006; Jenkins, 2004; Jenkins & Yakovleva, 2006; Matthews, et al., 2004; Mudd, 2007a, 2007b; Peck & Sinding, 2003; Perez & Sanchez, 2009; Robertson & Jack, 2006; Sanchez, 2008). Scholars have been characterizing reported data, assessing quality, identifying trends. Overall, their studies indicate the following:

- the number of mining companies publishing sustainability reports is growing and is likely to keep growing;
- reporting is still concentrated on major companies;
- companies based in OECD countries are more likely to report;
- environmental and social types of reports were predominant in the 1990s. Today most reports are “sustainability” ones;
- the GRI framework has become mainstream (See Figure 3-11);
- reports have been disclosing performance and managerial information related to environmental, social, community, health and safety issues mostly at the organizational level;
- the quantity and quality of reported issues is enhancing; and
- third-party verification has been growing steadily, but still accounts for a minority of reports.



**Figure 3-11 - Geography and Proportion of Application Levels and External Assurance in the 2009 GRI-based Mining and Metals Sustainability Reports (n=81)**

Source: GRI (2010a).

Olof Löf also found that images and pictures in annual reports, not only “texts and numbers”, have been mirroring the rhetoric of sustainability (Löf, 2009a, 2009b). His analysis shows that, in the 1970s and 80s, the covers of mining companies’ annual reports focused on extraction itself. The images illustrating those “old” covers portrayed mines, minerals, workers, and metals. But the aesthetics of current reports is rather different. Companies are increasingly

making collages, in which they mix a number of different pictures portraying the social and environmental correctness of the company. Among the most common images today are “women, children, hands, animals, and above all, images of nature (...)” (Löf, 2009a, p. 24).

The rhetoric behind these images and texts is essentially grounded on the growing and intertwined cultures of corporate social responsibility and corporate sustainability. Mining companies, in line with a global trend, are trying to portray themselves as “responsible” corporate actors and contributors to sustainable development. What seems to be unique in the mining sector, however, is the rhetorical use of the concept of “social licence to operate”. As Wesley Cragg observes, mining companies’ reports often frame CSR or CS as necessary to obtain the social license to operate (Cragg, 2006). This license, as opposed to mining and environmental permits, “cannot be provided by civil authorities, by political structures, or even by the legal system” (Joyce & Thomson, 2010, no page number). It can only be achieved through social legitimacy, credibility, and trust from stakeholders from the local to the international level.

Sustainability reporting is one of the most powerful instruments that can be used to obtain social licenses to operate, insofar as they inform stakeholders about mining companies’ potential contributions to sustainable development. In this context, disclosures need to convey accurate and relevant information about the mining companies’ potential impacts on society and the environment; otherwise they can mislead stakeholders who participate in social and environmental decision-making of mining activities. The next chapter, however, will show that this has not been the case. There are several structural problems in the way which mining companies are framing the challenge of assessing and reporting sustainability, which inevitably translate into meaningless or misleading information.

### **3.7 Summary**

Mining corporations, in line with a global corporate governance trend, have been incorporating sustainability into their business ethics rhetoric. One of the clearest manifestations of this

phenomenon is their growing publication of sustainability reports based on the Global Reporting Initiative framework. Mining corporations account for the majority of the world's mineral production. The implications of their actions are significant in the sector.

By adopting the GRI, mining corporations have become susceptible to a range of criticisms. For years scholars have been highlighting problems in the way the framework guides organizations to evaluate sustainability performance.

As previously discussed, studies have been mostly attempting to describe or identify reporting trends, rather than propose ways to enhance it. How exactly should mining corporations report sustainability? What information should be considered? What are the challenges involved in the implementation of these changes? Who should participate in the process? How to deal with the geographical dispersion of mining operations? How to structure the report? Many questions await exploration. The following chapters set out to shed light on some of them.

## **Chapter 4 Assessing and Reporting Mining Corporations’ Contributions to Sustainability**

### **4.1 Introduction**

Narrowing the gulf between rhetoric and reality in sustainability requires, among others, sound indicators and assessment frameworks. Sustainability decision-making, in the mineral or any other sector, needs to be based on indicators that catch the interactions of corporations with the environment. Given the countless possibilities to design indicators, decision-makers also need a framework to enable the selection and operationalization of the most relevant ones.

Numerous sustainability indicators and assessment frameworks have been created since Agenda 21 emphasized that “indicators of sustainable development need to be developed to provide solid bases for decision-making at all levels and to contribute to a self-regulating sustainability of integrated environment and development systems” (UN, 1992, paragraph 40.4) According to the International Institute for Sustainable Development, in November 2009, there were 842 sustainability indicators initiatives worldwide (IISD, 2009). Among them is the GRI framework.

A thorough analysis of the GRI framework (as used by mining corporations) is a fundamental requirement if one is to come to a determination about whether mining companies’ current sustainability reports can present meaningful and reliable information about “contributions to sustainability”. As Chapter Three has shown, most large mining companies are using, or being pressured to use, this framework. Surprisingly, however, very few studies have analysed how well the GRI enables mining corporations to evaluate their contributions to sustainability, despite the growing influence of that framework in the sector. A number of studies, as discussed in Section 3.4.4, have alluded to the general problems of the GRI G2. Nonetheless, few authors, if any, have tried to understand the extent to which the GRI G3 framework and its MMSS need to improve to meet the desirable requirements of an effective sustainability assessment and reporting tool.

This chapter addresses this gap and answers the first research question: “What needs to be changed in mining corporations’ current approach to assessing and reporting sustainability for the purpose of promoting more meaningful and reliable sustainability disclosures?” A robust introduction to the main approaches and related terminology to assess sustainability developed in the past two decades paves the way for understanding the opportunities to improving mining companies’ reports. This chapter highlights that, despite the growing number of approaches, there has been increased consensus on a number of principles that should be observed in sustainability assessment and reporting processes. Drawing also on primary data, the chapter evaluates the extent to which the GRI G3, along with its MMSS, is allowing mining corporations’ reports to meet those principles. Based on this analysis, a number of specific changes that need to be implemented in current reporting frameworks are identified and presented.

## **4.2 Making Sense of Sustainability Assessment and Reporting Frameworks**

Studies on sustainability indicators abound in the literature (e.g. Bell & Morse, 2008; Bossel, 1999; Lawn, 2006; Meadows, 1998; G. Mitchell, 1996; OECD, 2001; Victor, 1991). For at least two decades scholars and institutions have been designing and criticizing sustainability indicators that can be used in the assessments of projects, institutions, ecosystems, cities, regions, countries, or of the biosphere as a whole. Many studies mention the need to use indicators along with other assessment elements, such as technical guidance, conceptual models, visions, policies, goals, etc. The terms used to describe the combinations of such elements vary substantially. Among the most common ones are tools, methods, initiatives, systems, instruments, processes, or, as GRI prefers, frameworks.

The meaning of “sustainability framework” is debatable. This term has been described in several ways, often on an ad hoc basis. A framework is, in its simplest conception, a structure composed of **parts framed together to support anything**. When used to support sustainability assessment and reporting, a framework includes “parts” like indicators, indices, conceptual

models, principles, criteria, goals, policies, among others. A framework can also be made up of different frameworks, which can, in turn, include other frameworks. For example, the world's largest mining company, BHP Billiton, has a unique Sustainability Framework that encompasses several frameworks (BHP Billiton, 2009a). Among these is the SDF of the ICMM and its GRI G3 framework. Frameworks may also vary in foci. They can be broad and general or more focused and specific.

The effective design of sustainability assessment and reporting frameworks can be rather controversial, as a variety of approaches can underpin such a purpose. These approaches are not mutually exclusive. They can be, and often are, combined to form unique assessment tools.

#### *4.2.1 Indicators-based Approaches*

Sustainability indicators are arguably the most common elements in sustainability frameworks. Disciplines such as biology, economics and engineering have long been using indicators to gauge properties and trends of systems. When sustainability emerged as a worldwide vision, indicators were rapidly seen as a fundamental component in the operationalization of that vision. Numerous sustainability indicators were developed in the past two decades.

There has been useful progress. Indicators are becoming more standardized and increasingly linked to clear directions and targets. Nonetheless, major challenges remain. In a recent book, Tomás Hak and others (2007) reviewed many conceptual, technical, and political problems in the design and promotion of sustainability indicators. Their review indicated that “probably the only generalization one can make about indicators or indices used or proposed is that there is no ideal indicator that fully encompasses all the desired qualities.” (Hák, et al., 2007, p. 2) Among these qualities are the following:

- *simplicity* - the final indicators should be as simple as possible;
- *scope* - the indicators should cover the whole spectrum of human activities related to economy and environment but overlap amongst particular indicators should be as small as possible;

- **quantification** - the elements should be readily measurable;
- **assessment** - the elements should be capable of being monitored to establish performance trends;
- **sensitivity** - the chosen indicators should be sensitive enough to reflect important changes in environmental characteristics; and
- **timeliness** - frequency and coverage of the elements should be sufficient to enable timely identification of the performance trends. (Harger & Meyer, 1996, p. 1753)

Achieving simplicity, relevance, appropriate scope and representativeness, among other qualities associated with indicators, may be relatively easy in clearly bounded, simple contexts. The successful use of the red-yellow-green lights to control traffic behaviour is a perfect example of such a context. Yet sustainability is much more complicated. What it means, implies, and requires depend on the observer, scale of analysis, and political context, among many other factors. Choosing the best sustainability indicator is not always easy. As Table 4-1 shows, there are many types of indicators, which may vary in nature, level of aggregation, purpose, timing, relevance, and thematic domains.

**Table 4-1 - Types of Sustainability Indicators**

Criteria	Examples					
<b>Nature</b>	Quantitative	Qualitative				
<b>Level of aggregation</b>	Non-integrated	Aggregated	Integrated	Composite	Index	
<b>Purpose</b>	State	Pressure	Response	Interaction	Performance	Management
<b>Timing</b>	Lagging	Leading				
<b>Relevance</b>	Core	Supplemental				
<b>Domains</b>	Environment	Social	Economic	Sector	Human Rights	Community

Indicators can be qualitative and take the form of textual expressions (bad, good, optimal), colour (red, green, yellow) or even shapes like the ones used in sheet music to signal changes of rhythm, tonality, etc. Yet in managerial and scientific realms, there is a clear preference for quantitative indicators, that is, numbers that can be used in mathematical calculations. The purpose of qualitative or quantitative indicators can vary. Indicators can signal the state of an



ecosystem (biodiversity), the pressure on a river (effluent), the responses in place to tackle a social problem (policies, procedures, etc.), among many others. Similarly indicators can be classified according to their “time” content, that is, to their capacity to indicate future (leading) or past (lagging) events. In a health and safety context, lagging indicators would be, for example, fatality and injury rates, whereas leading indicators would be management and audit programs to prevent accidents. In terms of relevance in the decision-making process, indicators can be “core or key” in the sense that they can significantly affect the decision, or supplemental, if they only provide marginal data or trends. In sustainability evaluations the decision of which indicators set to use is further complicated by the diversity of domains that indicators can cover. Environment, society, economy, human rights, biodiversity, every dimension of sustainability can be captured by several types of indicators. In this context, the appropriate identification of indicators can be rather debatable.

#### 4.2.1.1 Non-aggregated versus Aggregated Indicators

The level of aggregation is one of the most debated issues in the design of sustainability indicators. There are roughly two approaches: (1) the non-aggregated indicators set, in which several or many indicators are reported in isolation; and the (2) aggregated<sup>20</sup> index, where just one number that combines sub-indicators and other variables is reported (Mitchell, 1996). The former typically results in the publication of many indicators covering the so-called three domains of sustainable development: environment, society and economy. These domains, however, can be differently described or broken down. For example, the GRI G3 framework includes a non-aggregated set of sustainability indicators organized according to the following categories: organizational strategy and profile, economic, environmental, social, human rights, society, and product responsibility.

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<sup>20</sup> The taxonomy of aggregated indicators can be more nuanced. For example, Hák and others (2007) classify these indicators into three types: (1) Aggregated indicator, which combines indicators defined in the same units, usually based on additive aggregation methods. (2) Composite indicator, which combines various aspects of a given phenomenon into a single number with a common unit, but using more complex aggregation methods. (3) Index, which combines data measured in different units.

One of the main advantages of the non-aggregated approach is that it is less demanding, insofar as it does not try to calculate the relative values among indicators and integrate them. This advantage in design can, however, be a disadvantage in use. Decision-making, especially among policy makers and the general public, may require an overall sense of what the many indicators indicate about the sustainability of the observed system (Morse, et al., 2001). Sets of indicators can appear very technical or complicated to those who make decisions. A variety of sustainability indices have been developed in the past two decades. Some of them, like the Ecological Footprint (EF), have achieved some popularity and are frequently cited in reports and journalistic and academic articles.

The need for sustainability indices is hardly disputed, but scholars frequently debate the methods that should underpin the aggregation process. The construction of indices involves a number of procedures that can be rather subjective and arbitrary. Among these are the estimation of error in data, the inclusion or exclusion of indicators<sup>21</sup>, the normalisation, and the weighting of relative values. Christoph Böhringer and Patrick Jochem recently assessed the extent to which some sustainability indices met scientific requirements of index formation and concluded that all the indices were “doomed to be useless if not misleading with respect to concrete policy advice” (Böhringer & Jochem, 2007, p. 7).

Even internationally recognized indices, like the Ecological Footprint, are contested. Jeroen Bergh and Harmen Verbruggen scrutinized the methodology of the EF and concluded that this tool does not provide sufficient information about ecological impacts, particularly at the country-level (Bergh & Verbruggen, 1999). Many articles in the *Ecological Economics* journal followed up on Bergh and Verbruggen’s paper, trying to further understand how to strengthen the EF (Fiala, 2008; Kitzes, et al., 2009; Wiedmann, et al., 2006).

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<sup>21</sup> Some indices, like the Living Planet Index (WWF, 2008), aggregates hundreds of variables, whereas other aggregate just a few.

**Table 4-2 - Popular Sustainability Indices**

<b>Index</b>	<b>Description</b>	<b>Application Level</b>
Ecological Footprint (EF)	There are several variations of the EF, but the “classic” one measures humanity’s demand on the biosphere, based on land and water required to provide the resources and absorb waste. When the index is greater than 1 it indicates “unsustainability”, i.e. a demand for resources greater than the biocapacity of the analysed area.	Countries, regions, cities, and biosphere
Living Planet Index (LPI)	The LPI measures the world’s biodiversity based on thousands of populations of vertebrates. The index calculates the average biodiversity index across all populations.	Biosphere and biomes
Human Development Index (HDI)	The HDI emerged as an alternative index of development to the GDP. It provides a composite indicator on three main areas: healthy life (life expectancy), education (adult literacy rate, gross enrolment ratio) and income (GDP per capita). The HDI emphasizes the “social” dimension of sustainability.	Countries, cities
Environmental Performance Index (EPI)	The EPI aggregates 25 indicators across ten policy categories in the “environmental” dimension of sustainability. The index gives an indication of the policy-implementation capacity of governments. The aggregated indicators cover outcomes, such as emissions and deforestation rates, as opposed to policy inputs.	Countries
Dow Jones Sustainability Indexes (DJSI)	The DJSI include over a dozen indices that measure the economic, environmental, and social performance of publicly listed companies. The aggregated indicators cover mostly policies and management practices related economic, environmental, and social issues. The index helps investor to reward companies that promote sustainability policies.	Publicly traded companies or group of companies

Source: (Collen, et al., 2009; Consolandi, et al., 2009; DJSI, 2010b; Emerson, et al., 2010; UNDP, 2008; Wackernagel & Rees, 1996; WWF, 2008)

A comparative review of these studies of aggregation methods reveals that sustainability indices, like other economic indices, need to be carefully considered in decision-making. Their “indications” reflect particular assumptions. This fact is revealed through the existing inconsistencies among different national sustainability indices. For example, Canada was ranked 4<sup>th</sup> on the EF (WWF, 2008), but 46<sup>th</sup> on the Environmental Performance Index (EPI, 2010). While both the EF and EPI emphasize the environmental dimension of sustainability, they indicate different “sustainability trends”. Such a discrepancy also highlights a terminological problem. The term “sustainability index” can and has been associated with indices that do not clearly relate to the concept of sustainability, but with particular dimensions of it, like environmental quality and human development.

With the exception of the Dow Jones Sustainability Indexes<sup>22</sup>, which track sustainability and financial performance of mining corporations listed in stock markets, the overall majority of sustainability indices today do not include minerals and mining in their sub-sets of indicators. Their indicators typically address energy use, water, biodiversity, pollution, social equity, education, economic development, among others. The amount of minerals extracted and available for future generations is usually overlooked. In reaction to this gap, a research group network launched the Mineral Footprint Initiative, which aims at coordinating “existing sustainable development research efforts to produce a set of tools, metrics and outreach materials communicating the roles that minerals, mining, and materials stewardship play in society’s transition to sustainability” (Anderson, 2010; Mineral Footprint, 2010). This initiative is, however, in its very beginning. In February 2010, it was just an “idea”. The methods needed to select and aggregate indicators have not been developed.

#### *4.2.2 Pressure-State-Response Approaches*

The sound aggregation of indicators depends on the selected indicators set. Trends in sustainability can be captured through countless indicators covering economic growth, decline in biodiversity, resource management policy, among many, many other issues. Identifying the most relevant indicators is a fundamental step in sustainability assessments. Donella Meadows calls these relevant indicators “leverage points” because their “presence or absence, accuracy or inaccuracy, use or non-use, can change the behaviour of a system, for better or worse” (Meadows, 1998, p. 5). Nonetheless, these leverage points are not always obvious. In some contexts, they may emerge intuitively, but, most frequently, they surface after careful consideration of the analysed problem. While these considerations may follow an ad-hoc or trial-and-error rationale, Hartmut Bossel argues that they should preferably follow approaches that have proven to be useful in the past (Bossel, 1999).

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<sup>22</sup> In September 21, 2009, the mining companies assessed by the DJSI included Anglo American plc., BHP Billiton Group, Barrick, Goldcorp. Rio Tinto Ltd. Goldcorp Inc. Newmont, Teck Resources, and Xstrata (DJSI, 2010a). These are all member companies of the ICMM.

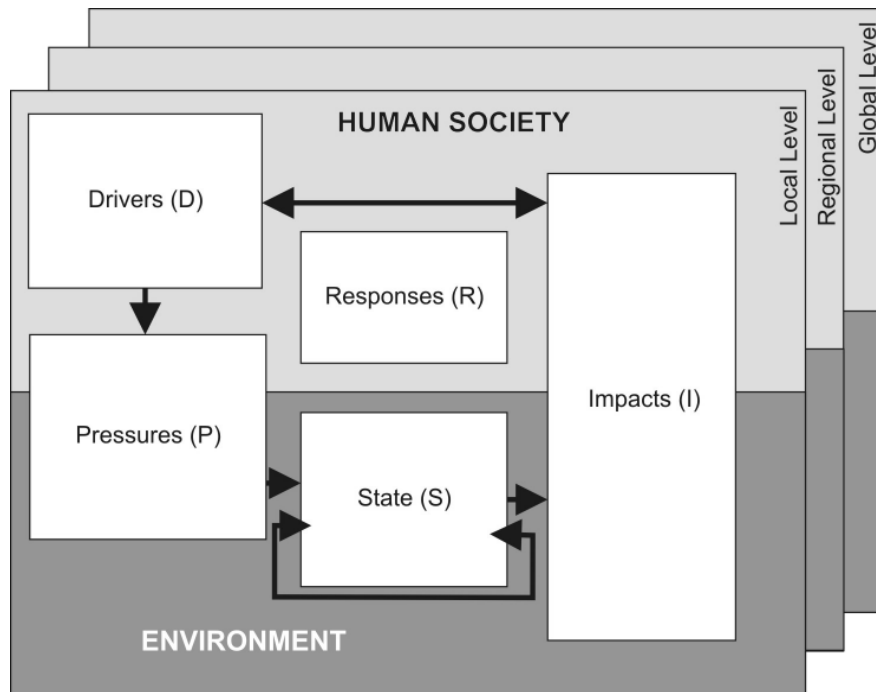
Among the most common approaches yet developed for the identification of sustainability indicators is the Pressure-State-Response (PSR) model, also known as Pressure-State-Impact-Response (PSIR), or Driving-forces-Pressure-State-Impact-Response (DPSIR). The PSR was created by Rapport and Friend (1979) in the late 1970s, and became very influential in the realm of environmental and sustainability reporting, particularly at the national and global levels. International organizations concerned with environmental issues, like the Organisation for Economic Co-operation and Development (OECD) and the United Nations Environment Programme (UNEP), have long been using variants of the PSR in their reports on the state of the environment (OECD, 2004; UNEP, 2007).

The PSR model emphasizes the relationships between human activities and the environment. It tries to understand the human pressures on the environment, resulting changes, and societal responses to those changes. This chain of cause-and-effect is evaluated through particular themes or issues at various scales. For example, with respect to climate change, the model requires indicators on CO<sub>2</sub> emissions from human activities (Pressure), CO<sub>2</sub> concentration on the atmosphere (state), increasing temperatures (impact), and political, regulatory, and behavioural actions towards curbing CO<sub>2</sub> emissions and increasing temperatures (response).

As in the case of aggregated indicators and indices, scholars often debate the methodological aspects of the PSR model. Some authors reasonably argued that in addition to human pressures, the model should consider natural pressures, such as solar radiation, volcanism, earthquake, and floods. Berger and Hodge (1998) raised dozens of natural geo-indicators that can influence the state of environment.

The PSR model, like any other system of indicators, provides a simplification of what happens in real life. It needs to be constantly enhanced and adapted to meet the needs of decision-makers. One of the most influential reports on the state of the environment – the Global Environmental Outlook (GEO) – has long been adopting and enhancing the PSR model. The GEO4 (the fourth GEO report) incorporated a “drivers” component to the model (see Figure 4-1). These drivers can be interpreted as indirect pressures, because their existence can boost or reduce pressures. Growing population, declining consumption, technological innovation, these

are all category of drivers that, according to the GEO4, require indicators to understand human's interactions with the environment.



**Figure 4-1 - PSIR model used in the GEO4 framework**  
 Source: Adapted from UNEP (2007).

The debate surrounding the PSIR model goes beyond understanding what indicators are missing or not. One of the most contentious issues for debate is how to establish relationships among pressures, states, impact, and response indicators. After all, these indicators do not act in isolation. As Bossel explains:

*The most serious objection to this [PSIR] approach is that it neglects the systemic and dynamic nature of the processes, and their embedding in a larger total system containing many feedback loops. Representation of impact chains by isolated PSIR-chains will usually not be permissible, and will often not even be an adequate approximation. Impacts in one causal chain can be pressures, and in another can be states, and vice versa. Multiple pressures and impacts are not considered. The real, usually nonlinear relationships between the different components of a chain cannot be accounted for. States and rates of change (stocks and flows) are treated inconsistently. (Bossel, 1999, p. 14)*

The *Millennium Ecosystem Assessment* (MEA), which is arguably the world's most comprehensive assessment on the state of the environment ever undertaken, considered Bossel's argument to a certain extent. Its report went beyond the PSR model by incorporating the influence of environmental impacts on human well-being, and, most importantly, by considering more systemic relationships among P, S, I, and R (MEA, 2005a). But, in spite of its sophistication, the MEA model is inevitably susceptible to critique. One could argue, for example, that it does not address enough social aspects, but mainly biophysical ones. There are endless possibilities to systematize the complex relationships between human activities and the environment.

#### 4.2.3 *Systems and Complex Systems-based Approaches*

The twentieth century witnessed the emergence of a new problem-solving approach that challenges the old dichotomies of facts and values, knowledge and ignorance (Funtowicz & Ravetz, 1993). Within this reasoning, sometimes called “complex systems thinking”, uncertainty and complexity are seen as inherent in systems. This view has evolved from a variety of theories (chaos, self-organization, etc.) but has not found its own unifying theory yet (Chu, et al., 2003).<sup>23</sup> Interpretations of what it means and implies may vary substantially among fields of inquiry. In spite of this plurality, scholars in many disciplines frequently agree that complex systems have the following properties.

*Hierarchical organization* – Complex systems are formed by, and connected with, other systems (complex and/or non-complex). They are hierarchically nested under a context-dependent “logic” that varies across scales and observers. Scholars, in trying to describe the hierarchy of complex systems, often resort to different terms, such as “holarchy” (Koestler, 1967) and “panarchy” (Gunderson & Holling, 2002).

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<sup>23</sup> Some authors (Jackson, 2003; McCarthy, 2006) have made references to “a” complexity theory. The contrast of publications, however, makes clear that there are actually several theories or approaches to complex systems. The work of Dominique Chu and others (2003) has provided a good background on this issue. To be more accurate, the present paper adopts the term “thinking” as opposed to “theory”, as others have done (Francis, 2005; Mainzer, 2007; L. White, 2001).

*Non-linear behaviour* – interactions among systems’ components are not governed by linear behaviours, but rather by chaotic, turbulent ones. Perturbations are not necessarily proportional to cause. Small actions can result in large effects; accordingly, strong forces can have no effect at all<sup>24</sup>.

*Self-organization* – With time, positive feedbacks outweigh negative ones, thus leading to increases in complexity in the system. This process occurs as a result of interactions of internal components in the system that frequently displays emergent properties (i.e. new patterns resulting from pre-existing lower-level ones).

Increasingly in the last decades publications have been emphasizing that social and ecological systems share the properties above (Adger, 2000; Holling, 1978; Singh, 1996; Waltner-Toews, et al., 2008). Accompanying these publications are strong arguments that systems thinking should be adopted in sustainability-oriented efforts, including indicators and assessment frameworks<sup>25</sup>. After all, sustainability requires the management of interrelated and often conflicting social and ecological systems.

Donella Meadows, a widely cited scientist and co-founder of notable sustainability institutions (e.g. Sustainability Institute, 2010; The Balaton Group, 2010), repeatedly highlighted the value of systems thinking in sustainability evaluations. Her influential co-publication series on the *Limits to Growth* (Meadows & Meadows, 2007; Meadows, et al., 1992; Meadows, et al., 1972; Meadows, et al., 2004) place systems modelling at the core of the evaluations of sustainability and resource scarcity. Meadows explains why:

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<sup>24</sup> The “butterfly effect” – a term arguably coined by the meteorologist Edward Lorenz (1993, p. 14) – is frequently used to describe this behaviour. Lorenz stated in 1972 that the flap of a butterfly in Brazil could set off a tornado in Texas. He wanted to emphasize the existence of flips and sudden changes in complex systems.

<sup>25</sup> The value of “system thinking” is commonly emphasized in many fields. Complex systems thinking, however, is more contentious. Michael C. Jackson (2003) has argued that there is not enough empirical evidence that complexity insights apply to the systems that managers regularly deal with, especially the social ones. While recognizing that complexity theories could encourage creativity and learning in organizations with their illuminating metaphors, Jackson argues that other types of systems thinking are likely to find “safer” use among organizations. Discussions on the merits of complex systems thinking need to be clear that the adoption of this reasoning can and should be accompanied by other types of systems thinking. The question is not whether complex systems thinking should be adopted, but how and to what extent managers can draw on these approaches. Jackson’s skepticism as to the value of complex systems thinking seems to overlook the possibility of combined and multiple adoptions of systems reasoning.



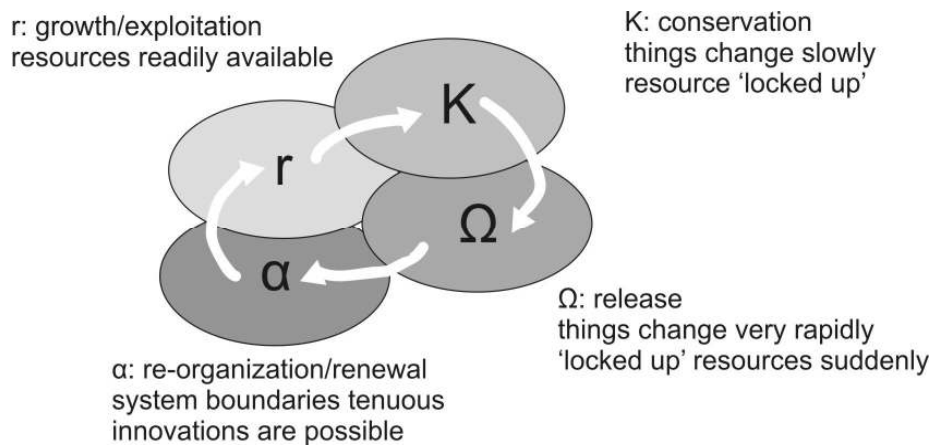
*What is needed to inform sustainable development is not just indicators, but a coherent information system from which indicators can be derived. The information system should be organized into hierarchies of increasing scale and decreasing specificity. Information from the hierarchy at all levels should be available to people at all levels (...)* (Meadows, 1998, p. ix)

The best evidence of the value of systems thinking or complex systems thinking in sustainability evaluations is the large number of studies applying such a rationale. The previously described variants of the PSR model are notable examples. Those models attempt to simplify the complexity of humans' interactions with the environment into a number of interrelated human-environment systems at local, regional, and global scales. Yet there are numerous other approaches that can be used to conceptualize those interactions.

#### *4.2.4 Resilience-based Approaches*

The resilience model is not as “famous” as the PSR, but is becoming increasingly influential. This approach has emerged from empirically-based research on the behaviour of natural systems. Although new and evolving, its tenets are easily identifiable in the works of its main proponents (Berkes, et al., 2003; Carpenter, et al., 2001; Gunderson & Holling, 2002; Holling, 1973, 1978, 1995, 2001; Walker, et al., 2004, Walker, 2006). Resilience provides a framework to understand the source and role of change in complex systems. Under this framework complex systems are framed as adaptive cycles, i.e. dynamic processes of exploitation, conservation, release and organization (Figure 4-2). Change, flips, or collapses in the system are inevitable. Accordingly, sustainability is not achieved by stabilizing components, but rather by maintaining the ability of the system to absorb disturbances and keep its basic function and structure. The challenge in this process, however, is to identify the resilience “of what” and “to what”, that is, to identify: 1) what aspects in the system need to be resilient; and 2) to which forces or impacts.

Another key concept related to resilience is panarchy. In studying the resilience of socio-ecological systems, scholars realized that elements of adaptive cycles were nested with cycles of different temporal behaviours. Fast cycles connected to slower cycles connected, in turn, to even slower cycles, and vice versa. This pattern of temporal relationships among adaptive cycles was named panarchy - hinted at by the name of the Greek god of nature, Pan.<sup>26</sup> The conceptual and sense-making power of resilience and panarchy has been corroborated by its growing adoption in recent academic works (Homer-Dixon, 2006; R. Plummer & D. Armitage, 2007; Voinov, 2008; Waltner-Toews, et al., 2008), and global reports on well-being and state of the environment (WRI, 2008).



**Figure 4-2 - Adaptive Cycle, as a Simple Loop**  
Source: Adapted from Resilience Alliance (2008)

Sustainability assessments based on resilience and panarchy frameworks require an understanding of the historical behaviour of the analysed systems, their boundaries, scales, indicators of disturbances, and thresholds that separate desirable states from undesirable states (Resilience Alliance, 2007a, 2007b). It is important to note that, while this framework has long been applied to natural systems, its application to social systems has received little empirical attention. Interestingly, one of the key barriers to sustainability is the resilience of some dominant social institutions that push for further industrial practices and modes of consumption that translate into environmental degradation. Few studies have explored ways to “break” the resilience of such institutions.

<sup>26</sup> The term was coined to avoid the word “hierarchy”, whose meaning may suggest rigid, top-down structures.

#### 4.2.5 *Ecosystems-based Approaches*

Resilience and panarchy models can be interpreted as sub-types of the broader “ecosystem approach” to sustainability evaluations. The ecosystem approach, which is also grounded in the tenets of systems thinking, was defined in the Convention on Biological Diversity (CBD) as a “strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way” (UN, 2003). Such an approach highlights the need for systemic and holistic frameworks in the management of ecosystems and their interrelated social and environmental issues. The CBD has argued that, in the operationalization of this approach, it is fundamental to take into consideration the following principles: (1) focus on the relationships and processes within an ecosystem; (2) enhance benefit-sharing; (3) use adaptive management practices; (4) carry out management actions at the scale appropriate for the issue being addressed, with decentralization to the lowest level, as appropriate; (5) assure inter-sector cooperation (UN-CBD, 2009).

There are, however, variations on interpretations of what an ecosystem approach means and implies (Kay, et al., 1999; Kay & Schneider, 1994; Rooney, et al., 2007; Waltner-Toews, et al., 2008). A number of authors, when prescribing sustainability assessment frameworks, implicitly consider some aspects of the ecosystem approaches, such as focus on the interactions among human and natural environment, holism, scales, participatory decision-making, precaution, and learning. The works of Hodge (1997) and Gibson and others (2005) are notable examples. The aforementioned *Millennium Ecosystem Assessment* (MEA, 2005b) and the report *The Limits To Growth* (Meadows, et al., 1972) also mirror some of the ecosystem approach’s tenets.

#### 4.2.6 *Capital-based Approaches*

Many of the studies based on systems thinking and ecosystems approaches also draw on capital-based frameworks. Donella Meadows, for example, suggested a sustainable development indicator framework based on the Herman Daly’s Triangle, which organizes the

relationships between humanity and the environment through hierarchical layers of capitals (Daly, 1977; Daly, et al., 1989; Daly, et al., 2004). At the base of the pyramid are natural capitals, which provide the ultimate means to all life and economic activity. On the top of natural capitals are built capitals, which provide the intermediate means for the economy (e.g. tools, machines, processed materials, buildings, etc.). A step higher is human capitals or “intermediate ends”, which include health, knowledge, and motivation, among other emotional and spiritual capacities. Finally, on the top of the pyramid are the ultimate ends, that is, happiness, harmony, equity, self-respect, enlightenment, among many others. In Meadows’ view, sustainability is a “call to expand the economic calculus to include the top (development) and the bottom (sustainability) of the triangle” (Meadows, 1998, p. x).

The Daly Pyramid reflects an extensive and growing body of scholarly work that attempts to make the discipline of economics more “mindful” of its desirable ends and physical limits. Since at least Adam Smith’s classic book *The Wealth of Nations* (Smith, 1937, originally published in 1775), scholars have been criticizing economic models based on the assumption of ever-growing economies. The previous discussions in Section 3.5.3 of the works on mineral and resource economics from Solow, Hotteling, and Hartwick are notable examples of such studies.

Humanity’s predominant economic models, notably neoclassical ones, place too much emphasis on means (material, physical goods) rather than ends (well-being). Moreover, they often overlook the limited availability of natural resources and ecosystems services to support economic growth. The incorporation of different types of capitals, such as natural, human and social, into economic models is often seen as fundamental in sustainable development. Unless society starts to “value” those capitals, economic models and indicators are likely to keep promoting growing environmental degradation and accumulation of built capitals, without necessarily leading to human well-being.

There have been literally thousands of works on sustainability that draw on capital-based frameworks or, as David Pearce and Giles Atkinson (1993) put it, capital theories. Among the most debated issues in connection with this field is the weak-versus-strong sustainability, i.e.

the extent to which society should allow substitutions of natural and human-made capitals between generations. The strong version, the one that argues for a complementary view of those capitals, in which substitutions need to be carefully considered (Daly, et al., 1995), are more in line with ecosystem and complex system approaches.

Another debated issue is the number of, and relationships among, capitals. For example, the World Bank has published studies based on a four-capital framework that includes man-made, natural, human, and social (Serageldin, 1996), whereas the Forum to the Future argues for a broader framework that distinguishes “financial” capitals as well (Forum for the Future, 2010). Capital-based frameworks are enticing to policymakers because they share the language of capitalism, thus avoiding a sense of utopia or *ecotopia* (Callenbach, 1990). As John Porritt explains,

*Although it is true that many environmentalists and social justice campaigners remain wary of getting sucked too deep into the working practices and language of capitalism, the premise behind the idea of the Five Capitals Framework is that we can't reform capitalism without adopting some of its insights, tools and drivers.*(Porritt, 2007, p. 137)

#### 4.2.7 Life Cycle-based Approaches

Approaches to designing sustainability assessment and reporting frameworks usually place geographical areas or natural systems at the centre of the analysis. The focus is on the complex interactions of geographically-bounded human activities (cities, countries, etc.) with the natural environment. Recent years, however, have seen the development of frameworks that attempt to evaluate the interactions of “flowing” impacts, such as material supply and product trade, with society and the environment. These approaches are based on a spin off of system thinking known as life cycle thinking. A number of tools, such as life cycle assessment (LCA) (Owens, 1997; Rebitzer, et al., 2004), life cycle costing (LCC) (Kirk, 1979; Woodward, 1997), supply chain management (SCM) , material flow analysis (MFA) (Brunner & Rechberger, 2004; NRC, 2004), can be used for such a purpose.

Life cycle frameworks have traditionally underpinned the understanding of operational, economic, environmental, and to a lesser extent, social aspects in the value chains of materials, energy, and products. Nonetheless, recent years have been witnessing attempts to make those tools capable of addressing sustainability as well. Authors have been conceptualizing broader frameworks, which are becoming known as Sustainable Supply Chains Management (SCC) (BSR, 2007; IIED, 2008; NZBCSD, 2003; Svensson, 2007), Life Cycle Sustainability Assessment (LCSA) (Kloepffer, 2008; Zmagni, et al., 2009) and Product Sustainability Assessment (PROSA) (Gensch & Manhart, 2007; Griebhammer, et al., 2007). These efforts are intended to make life cycle-based tools more inclusive of social, environmental, and economic issues, as well as the interrelationships among them.

#### *4.2.8 Forward-looking Approaches*

Most of the approaches described above, particularly those based on indicators, have a strong ex-post temporal orientation, in the sense that they assess progress towards (or away from) sustainability based on past developments. Assessments can, in addition, take a more forward-looking or ex-ante approach by trying to predict the future state or sustainability of cities, regions, projects, policies, and programmes. Common techniques used for this purpose include scenario-building, visioning, and backcasting.

##### *4.2.8.1 EIAs, SEAs, and SIAs*

Forward-looking approaches are commonly used in environmental impact assessments (EIA), because license-granting authorities in many jurisdictions are legally required to make decisions based on an understanding of the future outcomes of proposed actions. While early EIAs tended to propose technical solutions to mitigate a few environmental impacts of projects, recent assessments are considering more social and environmental issues, strategic factors, public participation, and sustainability criteria (Gibson, 2002).

The terminology surrounding these studies has also evolved. The 1990s witnessed the consolidation of the term Strategic Environmental Assessments (SEAs) to refer to the impact assessments of more strategic policies, plans, and programmes (PPP) (Partidário & Clark, 2000). According to Sadler and Verheem (1996), one of the main benefits of SEAs is that they can enhance the effectiveness of EIAs of projects, by anticipating and articulating the many impacts and cumulative effects that may result from PPPs. While SEAs tend also to incorporate sustainability principles (Partidário, 2003), recent years are witnessing a variety of new terms, such as “Sustainability Impact Assessment” (SIA), “Sustainability Appraisal”, or “Integrated Assessments”, to describe assessments that consider the integration of a broader range of socio-environmental issues and, most importantly, sustainability principles or criteria (George & Kirkpatrick, 2007; Gibson, et al., 2005; Pope, et al., 2004; Pope, et al., 2005). While there are significant variants amongst these new types of assessments, most of them seem to share a forward-looking and integrative approach to decision-making underpinned by sustainability principles.

A number of recent impact assessments of proposed mining projects in Canada were based on sustainability-based evaluative frameworks (Fonseca & Gibson, 2008; Gibson, 2006). These new assessments seem to indicate a new trend in impact assessments.

#### 4.2.8.2 The Natural Step Framework

The Natural Step Framework (TNSF) is a sustainability assessment tool that is clearly based on complex systems thinking and forward-looking approaches. It was created by an NGO to help private and public organizations progress towards sustainability. The TNSF distinguishes itself by using the concept of backcasting from sustainability principles. The framework requires users to envision sustainability in their context and then establish a strategy towards that vision. The authors of the framework argue that backcasting is more effective than “relying too much on forecasting, which tends to have the effect of presenting a more limited range of options, hence stifling creativity, and more important, [projecting] the problems of today into the future” (The Natural Step, 2010a, no page number).

In envisioning sustainability, users need to follow four principles or four systems conditions (Table 4-3) and constantly adapt their strategies. To help visualize the pursuit of the vision, the framework adopts the metaphor of a funnel. The upper wall of the funnel represents the declining availability of resources and ecosystems services, whereas the lower wall represents society's increasing demand for resources and ecosystem services. It is within such a constrained context that strategic actions should take place.

**Table 4-3 - The Four Sustainability Principles of The Natural Step Framework**

<b>Four Systems Conditions:</b> In a sustainable society, nature is not subject to systematically increasing...	<b>Four Sustainability Principles:</b> To become a sustainable society we must...
1. concentrations of substances extracted from the earth's crust	1. eliminate our contribution to the progressive buildup of substances extracted from the Earth's crust (for example, heavy metals and fossil fuels)
2. concentrations of substances produced by society	2. eliminate our contribution to the progressive buildup of chemicals and compounds produced by society (for example, dioxins, PCBs, and DDT )
3. degradation by physical means	3. eliminate our contribution to the progressive physical degradation and destruction of nature and natural processes (for example, over harvesting forests and paving over critical wildlife habitat); and
4. and, in that society, people are not subject to conditions that systemically undermine their capacity to meet their needs	4. eliminate our contribution to conditions that undermine people's capacity to meet their basic human needs (for example, unsafe working conditions and not enough pay to live on).

Source: Based on The Natural Step (2010b).

Numerous governments and other organizations have used or are using the TNSF (Altomare, 2002). The website of The Natural Step gives many examples, but none of those include mining companies. This situation is understandable as the first system condition or sustainability principle of the framework (see Table 4-3) conflicts with mining companies, whose business is essentially to increase the concentrations of substance extracted from the earth's crust.



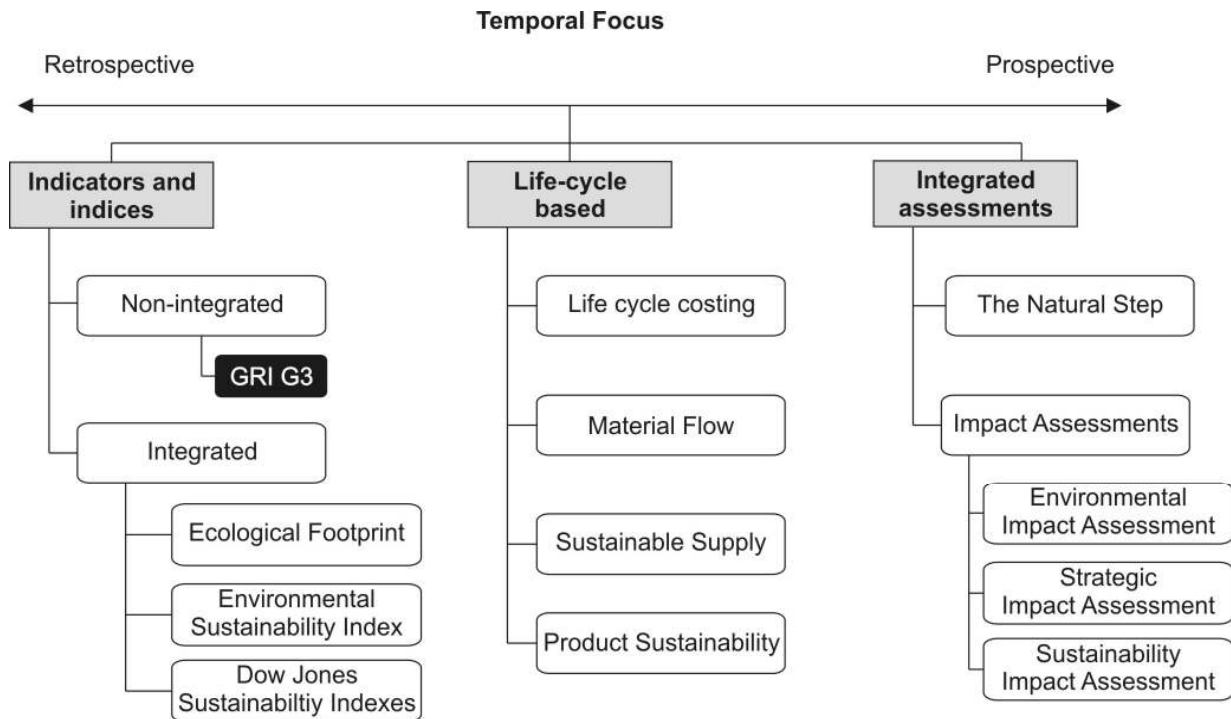
### 4.3 Principles for Effective Sustainability Assessments: the BellagioSTAMP

Sections 4.2.1 to 4.2.8 have described a number of approaches that can be used and combined to design sustainability assessment and reporting tools or frameworks. Temporal orientation, level of aggregation, spatial focus, number of indicators, systems conceptualization, these are some of the many aspects that can be taken into account. Such diversity is important to policy-makers and standard-setters, insofar as they can provide a range of alternatives that may suit different purposes and contexts. Nonetheless, it can also make the identification of the most effective approaches a rather confusing process. In light of this confusion, scholars have been increasingly scrutinizing sustainability tools to help clarify their elements and potential strengths and weaknesses.

Theo Hacking and Peter Guthrie (2008), for example, created a three dimensional diagram to help understand the differences among types of sustainability assessments being applied in the decision-making of projects and PPPs. The diagram has three axes. The “x” indicates the level of comprehensiveness of sustainability areas or dimensions addressed by the assessments, ranging from only bio-physical to a wide range of environmental, social, and economic issues. Axis “y” indicates the focus or geographical coverage of the assessment, ranging from projects to regions and countries. Finally, axis “z” indicates the level of integration of the techniques and sustainability themes of the assessment. Assessments that explore the interrelationships and trade-offs among those tools are considered more robust, and, as such, are located at the extreme of axis z. According to the authors, the lack of clarity on those features, “frequently hampers constructive debate between commentators from various jurisdictions, ‘schools of thought’, and/or disciplinary backgrounds.” (Hacking & Guthrie, 2008, p. 86)

Barry Ness and others (2007) undertook a similar study, but they considered a larger quantity of tools. They also created a diagram to categorize the many types of sustainability assessment tools, but following a two-dimension rationale. The many tools were arranged according to their temporal focus (retrospective or prospective) and to three categories: 1) indicators/indices, 2) product-related assessment, and 3) integrated assessments. Within these categories, the authors created sub-categories related to level of nature-society system

integration, spatial focus, etc. To illustrate Ness and other's rationale, several of the tools discussed in the previous sections, including the GRI G3 framework, were arranged according to some of their suggested categories. The results can be seen in Figure 4-3.



**Figure 4-3 - Categories of Sustainability Assessment Tools**  
Source: Adapted from Ness and others (2007).

The categorization of sustainability tools above, like the original one from Ness and others, are imprecise. Degrees of temporal focus and integration were arbitrarily attributed without considering, for example, the existence of combined temporal orientations. Different scholars and institutions might disagree with that arrangement. Nonetheless, Figure 4-3 helps policy makers realize that, while many tools claim to be able to assess “sustainability”, they display significant differences in terms of spatial, temporal, and aggregation approaches.

Numerous authors are becoming concerned about the proliferation of sustainability assessment tools. Hák and others, after reviewing a plethora of sustainability indicator initiatives, realized that more guidance on the design and selection of these tools is needed; otherwise they will

continue to be designed and selected not because of their effectiveness, but because of their political influence. As they explain:

*Letting the present anarchy continue until survival of the fittest prevails or implementing more strategic intervention and guidance of the process. The former might lead to the survival of the financially and politically strongest rather than the scientifically most appropriate, with a bias toward the wealthiest countries. It would be in the interest of the international community to try to make the process more balanced and objective by giving it some direction or leadership. (Hák, et al., 2007, p. 13)*

During the research, dozens of papers and books were reviewed to help identify a set of criteria for evaluating the soundness of the sustainability assessment and reporting framework being used by global mining corporations: the GRI G3. Numerous criteria were found, though most of them seemed to reflect the requirements of particular contexts, sectors, or geographical regions. Nonetheless, amidst that plurality, a set of eight criteria, known as the Bellagio Principles for Sustainability Assessment, seemed credible and comprehensive enough to support the evaluation of frameworks such as GRI's.

The Bellagio Principles are not another approach or framework to assess sustainability (like the ones described in previous sections), but a set of criteria that should be used to design new sustainability frameworks or evaluate existing ones. The principles emerged in reaction to the need for consensus over the desirable characteristics of effective sustainability evaluation and communication frameworks.

The first version of the Bellagio Principles (1996) included 10 principles that were unanimously endorsed by a group of measurement practitioners and researchers from five continents that met in Bellagio, Italy, to synthesize insights from practical ongoing efforts on sustainability assessment. The purpose of the principles was to “serve as guidelines for the whole of the assessment process including the choice and design of indicators, their interpretation and communication of the result” (Hardi & Zdan, 1997, p. 1). The principles drew on many of the approaches discussed in the previous sections, but, as Simon Bell and Stephen Morse (2008) noted, they emphasized three key elements: first, a clear vision of what

sustainable development means; second, holism in the assessment and indicators development; and third the need for time and spatial scales.

The value and sense-making power of those principles have been corroborated by their extensive application in sustainability studies (e.g. Becker, 2004; Bell & Morse, 2008; Bossel, 1999; Devuyt, 2000; Diesendorf, 2001; Dunphy, et al., 2000; Geßner, et al., 2001; Hodge, et al., 1999; Kay, 2000; McCool & Stankey, 2004; Muula, 2007; Piper, 2002; Schertenleib, 2000; Steurer, et al., 2005). The principles, more recently, were revised by the IISD and OECD to become more influential and concise, while reflecting the newest scientific and political context. The newest version, which can be seen Table 4-4, includes eight principles.

**Table 4-4 - BellagioSTAMP Principles**

<b>Principles</b>	<b>Description</b>
1 – Guiding Vision	Assessing progress towards sustainable development is guided by the goal to deliver well-being within the capacity of the biosphere to sustain it for future generations.
2 – Essential Considerations	<p>Sustainability Assessments consider:</p> <ul style="list-style-type: none"> <li>▸ The underlying social, economic and environmental system as a whole and the interactions among its components</li> <li>▸ The adequacy of governance mechanisms</li> <li>▸ Dynamics of current trends and drivers of change and their interactions</li> <li>▸ Risks, uncertainties, and activities that can have an impact across boundaries</li> <li>▸ Implications for decision making, including trade-offs and synergies</li> </ul>
3 – Adequate Scope	<p>Sustainability Assessments adopt:</p> <ul style="list-style-type: none"> <li>▸ Appropriate time horizon to capture both short and long-term effects of current policy decisions and human activities</li> <li>▸ Appropriate geographical scope ranging from local to global</li> </ul>
4 – Framework and indicators	<p>Sustainability Assessments are based on:</p> <ul style="list-style-type: none"> <li>▸ A conceptual framework that identifies the domains that core indicators have to cover</li> <li>▸ The most recent and reliable data, projections and models to infer trends and build scenarios</li> <li>▸ Standardized measurement methods, wherever possible, in the interest of comparability</li> <li>▸ Comparison of indicator values with targets and benchmarks, where possible</li> </ul>
5 -Transparency	<p>The assessment of progress towards sustainable development:</p> <ul style="list-style-type: none"> <li>▸ Ensures the data, indicators and results of the assessment are accessible to the public</li> <li>▸ Explains the choices, assumptions and uncertainties determining the results of the assessment</li> <li>▸ Discloses data sources and methods</li> <li>▸ Discloses all sources of funding and potential conflicts of interest</li> </ul>
6 – Effective Communication	<p>In the interest of effective communication, to attract the broadest possible audience and to minimize the risk of misuse, Sustainability Assessments:</p> <ul style="list-style-type: none"> <li>▸ Use clear and plain language</li> <li>▸ Present information in a fair and objective way, that helps to build trust</li> </ul>

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	<ul style="list-style-type: none"> <li>▸ Use innovative visual tools and graphics to aid interpretation and tell a story</li> <li>▸ Make data available in as much detail as reliable and practical</li> </ul>
7 – Broad Participation	<p>To strengthen their legitimacy and relevance, sustainability assessments should:</p> <ul style="list-style-type: none"> <li>▸ Find appropriate ways to reflect the views of the public, while providing active leadership</li> <li>▸ Engage early on with users of the assessment so that it best fits their needs</li> </ul>
8 – Continuity and Capacity	<p>Assessments of progress towards sustainable development require:</p> <ul style="list-style-type: none"> <li>▸ Repeated measurement</li> <li>▸ Responsiveness to change</li> <li>▸ Investment to develop and maintain adequate capacity</li> <li>▸ Continuous learning and improvement</li> </ul>

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Source: (IISD and OECD, 2010)

The new principles, known as BellagioSTAMP<sup>27</sup>, share the core concepts and theories that underpinned the former, but have been reworded and simplified. They were also unanimously endorsed by a group of sustainability assessment experts<sup>28</sup> from across the globe who met once again in Bellagio, Italy (IISD and OECD, 2010).

Because the principles in Table 4-4 apply to the evaluation of frameworks such as GRI's and have been tested, updated, and repeatedly endorsed by many experts in the field, they were deemed appropriate to evaluate the extent to which the GRI G3 framework can indicate the

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<sup>27</sup> STAMP stands for SusTainability, Assessment and Measurement Principles.

<sup>28</sup> The experts included: Jan BAKKES, Senior Advisor, The Netherlands Environmental Assessment Agency (PBL); Simon BRISCOE, Statistics Editor, Financial Times; Dr. Nikhil CHANDAVARKAR, Chief, Communications and Information Management Service, Department of Economic and Social Affairs, United Nations; Dr. Shailaja CHANDRA, Executive Director, National Population Stabilization Fund, Government of India; Enrico GIOVANNINI, Chief Statistician, Organization for Economic Co-operation and Development (OECD); Dr. Edgar GUTIERREZ ESPELETA, Director, School of Statistics, University of Costa Rica; Jon HALL, Project Leader, Global Project on Measuring the Progress of Societies, Organization for Economic Co-operation and Development (OECD); Dr. Peter HARDI, Professor and Director, Center for the Social Responsibility of Business, CEU Business School, Central European University; Eszter HORVATH, Chief, Energy and Environment Statistics Branch, UN Statistics Division; Jochen JESINGHAUS, Scientific / Technical Project Officer, Econometrics and Applied Statistics, Institute for the Protection and the Security of the Citizen (Ispra), Joint Research Centre, European Commission; Jonathan LOH, Editor, Living Planet Report, WWF and Zoological Society of London; Dr. Robert-André MARTINUZZI, Director, Research Institute for Managing Sustainability, Vienna University of Economics and Business Administration; Robin MIÉGE, Head of Unit, DG Environment, European Commission; Dr. László PINTÉR, Director, Measurement and Assessment Program, International Institute for Sustainable Development (IISD); Dr. Ken PREWITT, Vice President for Global Centers & Carnegie Professor of Public Affairs, School of International and Public Affairs, Columbia University; David RUNNALLS, President and CEO, International Institute for Sustainable Development (IISD); Katherine SCRIVENS, Researcher, Organization for Economic Co-operation and Development (OECD); Rob SMITH, Director, Environmental Accounts and Statistics, Statistics Canada; and Dr. Tongsan WANG, Director, Institute of Quantitative and Technical Economics, Chinese Academy of Social Sciences.

contributions to sustainability from mining corporations. It should also be noted that those principles resonate with the conceptual/theoretical framework and the key lessons identified in the literature reviews and interviews. Despite their short history, the BellagioSTAMP principles have been used by several scholars and associations, including the UNEP and the Balaton Group (Pintér, 2009).

#### **4.4 The GRI G3 against the BellagioSTAMP: The Performance of a Sustainability Performance Framework in the Mining Context**

Below follows an evaluation of how the GRI G3 framework, as used by global mining corporations, addresses each BellagioSTAMP principle. The evaluation was based on a content analysis of the framework's documents and of sustainability reports prepared by mining companies. Further insights were drawn from the interviews.

Because the MMSS supplement was launched recently and has not been used by companies yet, the discussions of this document focused more on how it might affect sustainability reporting. It is important to bear in mind that the MMSS is a very limited supplement. It just provides a few new indicators to capture unique organizational mining issues. In doing so, the MMSS respect the main principles and tenets of the GRI G3 guidelines and related protocols.

##### *4.4.1 Guiding Vision*

*Assessing progress towards sustainable development is guided by the goal to deliver well-being within the capacity of the biosphere to sustain it for future generations.*

The GRI G3 emphasizes the overall goal of sustainable development<sup>29</sup> as a necessary vision to frame reporting, but not specifically in relation to the goal of delivering “well-being within the capacity of the biosphere to sustain it for future generations”. It should be noted, though, that the framework does mention the need to respect the carrying capacity of the biosphere through its “Sustainability Context” principle. This principle requires a discussion about

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<sup>29</sup> This concept is explicitly defined in accordance with the *Our Common Future* report (GRI, 2006b).

*(...) the performance of the organization in the context of the limits and demands placed on environmental or social resources at the sectoral, local, regional, or global level. For example, this could mean that in addition to reporting on trends in eco-efficiency, an organization might also present its absolute pollution loading in relation to the capacity of the regional ecosystem to absorb the pollutant. (GRI, 2006b, p. 11)*

Although not having indicators and specific guidance on well-being, the GRI G3 covers dozens of indicators on social, human rights, labour practices, environmental protection, among others, that are related to, and can promote, well-being. Moreover, the new MMSS, while providing further guidance on the GRI G3, explicitly and repeatedly corroborate the need to consider the well-being of employees and communities, though not “necessarily” of future generations (GRI, 2010d).

Surveys on the state of sustainability reporting among mining corporations, as discussed in section 3.6.2, show that these companies are, for the most part, framing their report as a response to the vision of sustainable development. Nonetheless, they also show that companies are not fully complying with the GRI G3 guidelines. Among the most overlooked aspects is the need to consider the aforementioned Sustainability Context principle.

For the purpose of this research, many mining companies’ sustainability reports from 2006-2009 (in addition to the reviewed surveys) were analysed to understand how those who crafted the documents interpret and implement the GRI G3. It became clear that while some principles, like materiality, have been increasingly mentioned and addressed, none of the reports clearly explained how the context principle was addressed. This “gap” was corroborated by many interviewees during the research. As one of them explains:

*I agree with you that it is not happening in any significant degree. I also believe that that particular principle, among the 10 or 11 principles, is probably the least in compliance, the least impact among the reporters. It came as an addition to G3, where the thinking was that, if we are going to claim to do a sustainability reporting program, the information reported does have to be placed in the broader context. So, we added that principle, but it has not been adopted very aggressively or frequently by reporters. I think the reason is that it takes work, many companies regard GRI as already very complicated, demanding on human resources, financial resources, and to develop a*

*sustainability context beyond what is specific to the company, you know, to for example express carbon emissions or water use, or health and safety in national or global context, would require an additional level of analysis. (RD-1)*

That said, the goal of sustainability as guiding vision seems to be clearly stated by the GRI G3 framework, but poorly implemented by mining corporations. As the following chapters will discuss, this disconnect between guidance and practice, might be a result of several conceptual and practical difficulties in the process of contextualizing information across geographical regions.

#### 4.4.2 *Essential Considerations*

*Sustainability Assessments consider:*

- *The underlying social, economic and environmental system as a whole and the interactions among its components;*
- *the adequacy of governance mechanisms;*
- *dynamics of current trends and drivers of change and their interactions;*
- *risks, uncertainties, and activities that can have an impact across boundaries; and*
- *implications for decision making, including trade-offs and synergies.*

This is one of the most important elements in the BellagioSTAMP. The principle implies that sustainability evaluations should adopt the previously discussed systems approach, with due regard to holism as opposed to reductionism. The earlier version of the BellagioSTAMP referred to this principle as “Holistic Perspective” (Hardi & Zdan, 1997). With the exception of the need to consider adequate governance mechanisms, all other requirements of the principle above reflect the view that indicators must be drawn from interconnected social, economic and environmental systems.

As already discussed in Section 3.4.4, the GRI framework has been repeatedly criticized for being reductionist and promoting the analysis of dozens of indicators that neglect interactive effects and do not clearly relate to each other and to the state of the socio-ecological systems from which they are drawn. As a result, sustainability reports, including those prepared by mining corporations, have been missing the “big picture” and running the risk of misinforming



decision-makers. Many of the interviewees corroborated the existence of this problem in mining companies' sustainability reports. A mining practitioner went further to explain why:

*I think we have not effectively reported on our overall impact or contribution to the system that we are within. I think it is partly due to the fact that there are very few other drivers that are pushing us, industries, to look at their operations from a context of how they fit into the overall ecosystem. And so, we fall back to permits and everything fall back to performance indicators of what are our compliance for example. (MP-1)*

The GRI G3 and its MMSS, while not using the jargon of the systems and complex systems literature, may suggest that a holistic or systemic perspective is fully dismissed. It should be noted, however, that the framework guides organizations to report their performance as it relates to the “context” of communities and ecosystems. The framework also touches on the need to consider risks and uncertainties across boundaries, by including an indicator that asks for an “explanation of whether and how the precautionary approach or principle is addressed by the organization” (GRI, 2006b, p. 23). Such an indicator often results in elusive statements about mining companies' strategies and governance approaches (e.g. BHP Billiton, 2009b; Xstrata, 2009).

Another relevant requirement of the Bellagio principle above is the need to understand synergies and trade-offs among indicators in the reporting process. The power of the sustainability concept lies in its ability to integrate economy, people and the environment in forward-looking decision making (Hodge, 1997). Such a requirement was partly reflected in the previous version of the GRI framework, the G2, which acknowledged that addressing sustainability in terms of pillars of economic, environmental, and social indicators “can sometimes lead to thinking about each element in isolation rather than in an integrated manner” (GRI, 2002, p. 2). The GRI G2 did not include integrated indicators or guidance on how to address trade-offs, but it encouraged users to search for them:

*Reporting organisations should also include other content, particularly integrated performance indicators, identified through stakeholder consultation. This information and these indicators may relate to sector- or geography-specific issues pertinent to the organisation. (GRI, 2002, p. 16)*

The GRI G3 and the recent MMSS do not explicitly require or encourage integration. Not surprisingly, most mining companies, if not all of them, have been publishing reports with “silos” of sustainability information. Many authors and mining stakeholders consulted for this research are concerned about this problem. According to one of them, this lack of “systemic” or “holistic” disclosures is partly a result of the lack of understanding of complex systems among industry people (IC-2). But one of the mining experts disagrees with this view. He argues that the problem is not so much a lack of understanding of what systems or complex systems means, but of how to apply it. “Companies will probably argue that they have a systemic view of their activities and that their sustainability reports reflect systems thinking, but an external stakeholder might disagree. People often concur that system thinking is necessary; disagreements surface when it comes to its operationalization.” (ME-3)

Julie Richardson (2004), in her critical review of the state of the art of sustainability reporting, pointed out that meaningful progress in this practice will depend on a stronger operationalization of systems thinking. She proposed a number of changes to the predominant non-systemic approach, shown in Table 4-5. In enhancing their reporting practices, mining companies will, inevitably, need to address with those changes.

**Table 4-5 - Systemic and Non-systemic Approaches to Sustainability Reporting**

Non-Systemic	Systemic
System understood in terms of components parts	Emergent characteristics of the whole system are different from the characteristics of its component parts
Focus on capital and money values	Focus on network patterns
Separate-silos and trade-offs	Synergistic relationships, feedback loops, and virtuous cycles
Measures static “snapshots” in time	Measures patterns of change, adaptation, and learning
Focus on measuring quantities relating to sustainability performance	Focus on enhancing qualities of sustainability
Reduces complex systems to a single denominator	Embraces diversity and complex patterns
Tools adapted from economics and accounting	Tools adapted from holistic sciences (physics, evolutionary biology, and ecology)

Source: Adapted from Richardson (2004).

#### 4.4.3 Adequate Scope

*Sustainability Assessments adopt:*

- *appropriate time horizon to capture both short and long-term effects of current policy decisions and human activities; and*
- *appropriate geographical scope ranging from local to global.*

The GRI G3 and its MMSS adopts a predominately retrospective and non-geographical approach to the selection of indicators, thus promoting sustainability reports that largely fail to meet the principle above. The GRI framework follows a financial accounting rationale, and guides companies to report on organizational issues. Such an approach reflects the lack of systems thinking that has long been criticized by scholars in the field of social and environmental accounting:

*(...) it is, of course, not the impact of individual organizations that matters but the interactions and total impacts that a range of organizations has on an ecosystem's carrying capacity. This requires a level of analysis that is quite different from the analysis assumed by organizational reporting, and one that requires decision-taking and action to be operable at, for example, local, ecosystem and/or national level – not at the level of organization itself. (Gray & Milne, 2005, p. 78)*

The purpose of the GRI framework is to promote standardized “organizational performance towards the goal of sustainable development(...)” among organizations of any size, sector, or location, “(...) from small enterprises to those extensive and geographically dispersed operations” (GRI, 2006b, p. 3). To enable such an ambitious goal GRI guides organizations to identify and report performance on the most relevant sustainability issues across the organization, with very little guidance on how to consider geographical variations and scales. Not surprisingly, the framework was categorized as an “issues-based” framework, as opposed to “geographically-based”, in IISD’s Global Directory of Indicator Initiatives (IISD, 2004).

One of the main drawbacks of an issues-based framework within organizations with geographically dispersed operations is that it hinders contextual disclosures. Most large companies reporting sustainability today have facilities in several or many countries, which are significantly influenced by their ecosystem, political, social, and economic contexts. With the

possible exception of GHG emissions, the overall contributions to sustainability of the mining company cannot be calculated by a simple aggregation of performance across sites.

GRI's protocol on Organizational Boundaries (GRI, 2005) and a paragraph of the guidelines briefly highlight the dangers of aggregating some types of data from different sites: "Reporting organizations should disaggregate information to an appropriate level using the principles and the guidance in the reporting Indicators. Disaggregation may vary by Indicator, but will generally provide more insight than a single, aggregated figure" (GRI, 2006b, p. 37).

Nonetheless, these documents do not elaborate on the technical complexities involved in the aggregation or disaggregation processes.

The interviewed mining practitioners revealed a great concern about this issue. As one of them said, "I think it [aggregation of data] is a big challenge for all reporters that I know. It is one of the big challenges that we face" (MP-3). Mining companies have been guided by the GRI to aggregate or disaggregate some indicators, but in trying to do so, they are hampered by the lack of compatible data and unit of analysis across sites. A Director of Corporate Social Responsibility exemplified this challenge:

*For example, when we talk about GRI, there is a requirement to report on a country by country basis your economic contribution. Well, that type of reporting is complicated, because, at the same time, you've got legally mandated financial reporting in a different way. So we get caught in a situation where we inadvertently have reported information in two different ways and there's not adequate quality control or whatever to ensure that we are in compliance with all the requirements. So, you know, that's just one example where, from a company standpoint, they would be concerned about how the indicators would be aggregated or integrated. (MP-1)*

In reaction to this problem, mining companies are starting to publish appendixes or webpages with additional data, tables, and statements presented on a facility by facility basis:

*(...) what we do in our report, we report on a number of aggregated numbers, like CO<sub>2</sub>, energy use, and that type of things, water use, but then on our website we have tables, EHS [environment, health and safety] tables, and those are split out by sites. We can put those up there so people can look at what is happening on the individual sites. We are looking to do, if and when our regional websites get up, then we will look to put*

*more explanations for the differences in regions. South America [facilities] already has a regional website. (MP-5)*

Nine out of the twenty largest mining companies, as previously shown in

Table 3-2, are also publishing facility-level, non-GRI sustainability reports<sup>30</sup>, which highlight some relevant issues in specific sites. This situation seems to indicate a trend towards the publication of not only organizational-level reports, but also facility-level ones. This trend is corroborated by the recent Facility-level Sustainability Reporting Guidelines that are being piloted by CERES, the same institution that created GRI (CERES, 2005; Ginsberg, 2006; Stoughton & Levy, 2004). This new guideline is supposed to complement the GRI G3, while bringing more geographical context to disclosures and, at the same, generating information that is relevant to local stakeholders.

The Bellagio Principle above emphasises the need for not only spatial, but also for appropriate temporal scopes. Meeting the “needs of future generations” requires consideration of time horizons broad enough to capture the time scales of humans and ecosystems. Such an imperative can be, nonetheless, rather difficult to implement. Insects, animals, reefs, landscapes, cities, each system component has a particular but interrelated temporal behaviour. Capturing the rationale under which they evolve requires understanding their histories, which may be a costly and lengthy process. But without such understanding, it becomes difficult to identify thresholds or limits against which to assess sustainability.

Moreover, given the uncertainties and complexities inherent in socio-ecological systems, planning over long time periods requires more adaptive approaches that take into account alternatives and scenarios. As previously discussed, recent scholarship has been emphasizing that not only spatial hierarchies, but also temporal ones can be helpful when dealing with time in sustainability strategies (Gunderson & Holling, 2002).

Although it endorses the ethics of respecting future generations’ needs, the GRI G3 is essentially retrospective. The assessment rationale favours the understanding of past-year

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<sup>30</sup> A few companies, like Anglo American, use GRI in some of their site-level reports (GRI, 2010a).

emissions, compliance with legislation, codes of conduct, and management standards. While allowing for benchmarking and comparisons over time, this approach is incapable of properly identifying cumulative impacts and adverse trends in the state of the environment and communities (Lenzen, et al., 2004). The framework encourages long-term visions, but in a superficial, elusive way. Scenario building, forecasting or backcasting are largely absent from its requirements. As a result, most mining companies' sustainability reports have been retrospective.

#### 4.4.4 Framework and Indicators

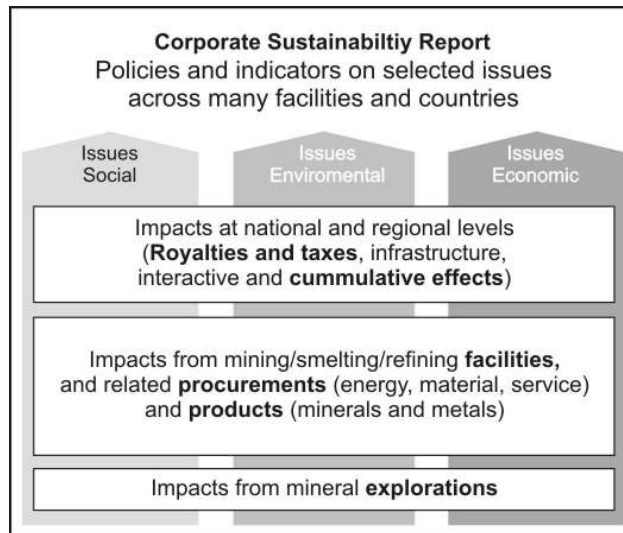
*Sustainability Assessments are based on:*

- *a conceptual framework that identifies the domains that core indicators have to cover;*
- *the most recent and reliable data, projections and models to infer trends and build scenarios;*
- *standardized measurement methods, wherever possible, in the interest of comparability; and*
- *comparison of indicator values with targets and benchmarks, where possible.*

In comparison with the previously discussed PSR, panarchy, and ecosystems-based models, the GRI G3 can be considered a simplistic framework. Its structure promotes the identification of indicators within categories of organizational issues, as follows: strategy and analysis; organizational profile; report parameters; governance, commitments, and engagement; economic; environmental; labour practices and decent work; human rights; society; and product responsibility. Through the MMSS, the framework also includes a few indicators related to Mining and Metals issues.

The GRI does not provide a conceptual framework to help identify the domains that core indicators should cover. In overlooking this Bellagio Principle, the framework may be further contributing to the problem of non-geographical, non-scaled, and non-contextual disclosures. The GRI G3 is often seen as a “shopping list of issues” (Baker & Savitz, 2008), as opposed to a structured sustainability indicator system. Not surprisingly, mining company reports often show simple tables or checklists to communicate their GRI compliance (e.g. Barrick, 2010; Rio Tinto, 2010). The conceptual framework implicit in mining companies' current reporting

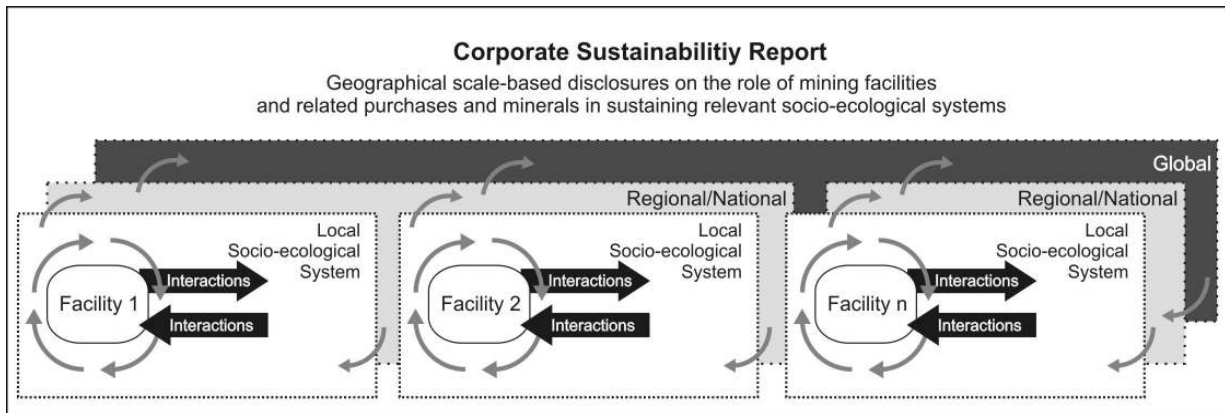
process, shown in Figure 4-4, favours a top-down, ‘pillar’ approach to identifying non-integrated issues across the company.



**Figure 4-4 - Tacit Conceptual Framework of GRI-based Sustainability Reporting among Mining Corporations**

On the one hand, the approach illustrated in Figure 4-4 promotes simple, reader-friendly reports, but, on the other hand, it may “hide” the complex interactions of the many mining operations with the environment. Figure 4-4 is, of course, a tentative and simplified conceptualization of what lies behind the identification of sustainability indicators in mining companies’ reporting processes. It highlights the fact that indicators have been drawn from issues across many exploration, mining, smelting, and refining facilities with little consideration for scales and geographical context. Perhaps, a more accurate conceptual framework of the current situation would show not only three silos of issues, but arguably several silos covering the GRI G3 indicator categories.

For the purpose of conceptualizing the reporting process in accordance with the Bellagio Principle above, the framework would need to be based not on issues, but on hierarchical nested systems. Figure 4-5 presents a tentative illustration of what such a framework would look like in the context of large mining companies.



**Figure 4-5 - Desirable Conceptual Framework of Sustainability Assessment and Reporting among Mining Corporations**

The figure above shows many facilities (1,2,...n) across nested socio-ecological systems from the local to the regional/national and global scales. It also attempts to show the need for a focus on the interactions of mining activities with the external environment, rather than on internal organizational “issues”. The arrows around mining facilities and across socio-ecological systems are intended to indicate the following: 1) Each mining facility needs to understand the implications of the life cycles of its operations and minerals to the sustainability of socio-ecological systems; and 2) These systems affect and are affected by each other.

Such a conceptual framework would foster the selection of indicators that cover the dynamic and contextual interactions of mining corporations with the external environment. For example, the GRI G3 and the new MMSS have six indicators on biodiversity (Indicators EN-11 to EN-15 and MM-2) that ask for an understanding of how the reporting organization is affecting the biodiversity of adjacent areas. These indicators – in a tacit issues-based conceptual framework – run the risk of translating into generic, non-contextual statements about the company’s overall plans and goals related to biodiversity. The recent sustainability report from BHP Billiton, illustrate this outcome. Its GRI G3 A+ report complied with most of these indicators by simply stating the following:

*We own, manage or lease approximately six million hectares of land (excluding exploration and development projects). As a result of our mining, processing, smelting and petroleum activities, we have disturbed 166,000 hectares of land of which 38,500 hectares have been rehabilitated. We also manage 11,000 hectares of land for*



*biodiversity conservation purposes. We have a five-year target of a 10 per cent improvement in our land rehabilitation index by 30 June 2012. This index is based on a ratio of land rehabilitated compared to our land footprint. In FY2009, the index decreased by three per cent due to the development of new operations in Australia and Chile. We have strengthened our biodiversity commitments related to protected areas and threatened species. This includes, firstly, the commitment not to explore or mine within International Union for the Conservation of Nature (IUCN) Protected Area Categories I to IV unless an action plan designed to deliver measurable benefits to biodiversity has been developed that is commensurate with the level of biodiversity impacts. Secondly, we will not proceed with activities where the direct impacts would result in extinction of IUCN threatened species. (BHP Billiton, 2009b, p. 14)*

BHP operates in about 70 locations worldwide (BHP Billiton, 2009b). The sweeping statement and aggregated numbers above have a very limited value for biodiversity decision-making. After all, has there been progress on the ground? What roles are BHP's operations playing in enhancing or not biodiversity? The conceptual framework in Figure 4-5, instead of sweeping statements, would promote an understanding of biodiversity trends within each socio-ecological system, with potential synergies and trade-offs among them. Of course, the more local the system, the less challenging it should be to understand those trends. The role of particular mining operations in more regional and global systems gets diffused amidst a multiplicity of factors. This scale would also facilitate evaluations of the controversial issue of mineral scarcity and long-term legacy. Interestingly, most mining corporation's GRI reports do not address these issues, which are among the most relevant impacts of the sector.

Figure 4-5 attempts to present the desirable conceptual framework from the BellagioSTAMP perspective, i.e. from the perspective of what would be necessary to generate relevant information about the contributions of mining corporations to the sustainability of geographical and scale-based socio-ecological systems. Such a framework is, however, far more complicated and technically demanding than the tacit one being promoted by GRI. It entails numerous barriers, which will be identified and discussed in Chapter Six. Among these is the need to have additional indicators on the state of the socio-ecological systems impacted by mining activities and related products and procurements. The GRI G3's indicators cover mostly organizational "pressures" and "responses", which are insufficient for the purpose of understanding mining companies' interactions with socio-ecological systems.

It should be noted, however, that GRI's tacit conceptual framework promotes the identification of indicators in a wide range of sustainability issues. As opposed to other mining sustainability frameworks that focus on a few issues, like the Towards Sustainable Mining Framework (Mining Association of Canada, 2009), the GRI framework has more than one hundred indicators covering governance, product responsibility, eco-efficiency, human rights, among many other categories. As one of the interviewees noted, this is one of the key strengths of the framework (MP-4). Its comprehensive set of indicator categories is drawing the attention of mining companies to dozens of issues previously overlooked. Despite its limitations, the GRI G3 may be starting to promote the cliché "what gets measure gets managed" in mining corporations' sustainability strategies.

The Bellagio Principle above also emphasizes the need for reliable data, scenario building, standardized measures, targets and benchmarks. All these elements, with the exception of scenario building, are emphasized by the GRI G3 as well. The purpose of the GRI G3 is precisely to promote reliable, standardized, goal-oriented, and comparable sustainability disclosures.

Whether the GRI is effectively promoting these qualities, nonetheless, is a rather contentious issue. For example, many scholars and institutions have been criticizing sustainability reports (including GRI-based ones) for presenting unreliable information. These critics often argue that corporations are "cherry-picking" issues and manipulating the reporting process to portray an image of a socially and environmentally responsible company (Adams & Evans, 2004; Hedberg, et al., 2003; MacLean & Rebernak, 2007). During the research, many interviewees, not only those representing NGOs, highlighted this problem as well.

One of the ways through which GRI tries to promote reliable data is by guiding companies to hire external verification. As previously explained in Section 3.4.3, GRI's Application Level System rewards externally verified reports with a "+" symbol. Yet external verification is still a marginal practice. Just about a quarter of the 2009 GRI-based reports were externally verified

(GRI, 2010a). Aware of this problem, the ICMM recently launched an Assurance Procedure whose contents and potential implications will be further discussed in Chapter Five.

#### 4.4.5 Transparency

*The assessment of progress towards sustainable development:*

- *ensures the data, indicators and results of the assessment are accessible to the public;*
- *explains the choices, assumptions and uncertainties determining the results of the assessment;*
- *discloses data sources and methods; and*
- *discloses all sources of funding and potential conflicts of interest.*

The principle above underpins the sustainability reporting process, as the GRI G3 is grounded on the transparency imperative (GRI, 2006b, p. 2). The framework's many documents (guidelines, protocols, supplements, application level system) are all available for free download in the internet. And so are mining companies' sustainability reports. The websites of most mining corporations today provide easily accessible links to their Corporate Sustainability or Corporate Social Responsibility reports, which can be accessed as downloadable stand-alone documents; downloadable sections or chapters of annual reports; online, web-based reports; or a combination of web-based with downloadable documents.

Company disclosures of choices, assumptions, and uncertainties in the reporting process are fundamental to the reliability of reported information. As the previous discussions have shown, GRI reporting entails a number of assumptions and arbitrary choices related to the identification of stakeholders, indicators, unit of analysis, aggregation processes, among others, that are not self-explanatory. To be thoroughly transparent, mining companies would need to provide a variety of additional information on their choices.

Yet this has not been the case. For example, although the overall majority of mining companies overlook the Sustainability Context principle, few of them, if any, explain why. Very little information is also provided on the potential uncertainties of data and on the criteria for mediating the stakeholder engagement, among many other steps involved in reporting.

One of the best examples of thorough and careful disclosures of corporate performance is the financial forms filed in the U.S. Securities and Exchange Commission (SEC), also known as SEC filings. To ensure that investors are sufficiently informed about publicly traded companies' financial performance, SEC requires these companies periodically to submit public access information on a number of forms, which translate into literally hundreds of pages of financial and corporate governance information. Yet, even under such "rigorous" requirements, accounting scandals continue to happen.

Sustainability reporting is much more complex than financial reporting. If the former were to adopt the levels of disclosures of the latter, it would probably result in thousands of pages. Countless barriers would be involved in moving sustainability reporting in that direction. Chapter Six highlights some of them.

#### *4.4.6 Effective Communication*

*In the interest of effective communication, to attract the broadest possible audience and to minimize the risk of misuse, Sustainability Assessments:*

- *use clear and plain language;*
- *present information in a fair and objective way, that helps to build trust;*
- *use innovative visual tools and graphics to aid interpretation and tell a story; and*
- *make data available in as much detail as reliable and practical.*

While financial reporting tends to be more detailed and thorough when disclosing data, sources, methods, and assumptions, it does not use as many innovative visual tools and graphics as sustainability reporting currently does. Sustainability reports, as mentioned in Section 3.6.2, usually show pictures, photos, among other graphical material, to help communicate the many narratives and performance data in connection with GRI indicators. Many corporations today, including mining and metal ones, are also using web-based tools that can contribute to more effective communication. Among these are interactive GRI tables, charts, and data; RSS Feed; forums; videos, audio, flash applications, PowerPoint slides.

There have been numerous studies and surveys on the means of communication employed in sustainability reporting (Adams & Frost, 2006; Isenmann, et al., 2007; Isenmann, et al., 2009; SustainAbility/UNEP, 1999; Wheeler & Elkington, 2001). One of the most recent ones, which investigated trends in online GRI-based reporting from 40 organizations, including several mining and metals companies, found that:

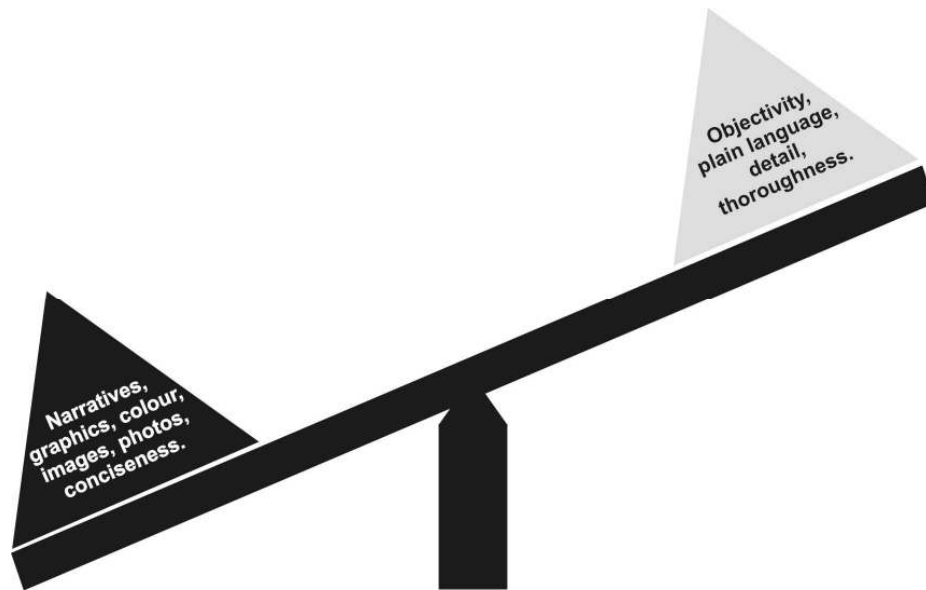
*When the first GRI Guidelines were released in 2000, most sustainability reports were a single, printed document. Today, for a variety of reasons, it is more accurate to talk about sustainability “reporting” – that is to say, providing public information across a range of channels. (Radley Yeldar and GRI, 2009, no page number)*

The researchers found that 60% of the organizations were reporting GRI information in more than one location. In addition to *Pdf* files, many companies were also disclosing full or partial online reports using interactive tools and multimedia material. GRI reporting has become far more sophisticated in the use of visual tools than financial reporting, but it is still less detailed and thorough in the disclosures of underlying data, methods, and uncertainties.

It is noteworthy that, while the GRI G3 framework does not explicitly encourage innovative visual communications, companies are doing so, thus meeting the Bellagio Principle above to a certain extent. One might argue, however, these companies are missing other requirements of effective communications, such as detail, clarity, and objectivity. A mining practitioner explained that his company decided to adopt the GRI G3 to bring more credibility to reporting and avoid interpretations of greenwashing. Nonetheless, readers were still sceptical about his company’s reports: “(...) when they look at the information they have a difficulty in separating between candid reporting and just public relations.” (MP-1)

Sustainability reporting among mining corporations is a rather challenging exercise, because it is supposed to meet the information needs of a wide range of stakeholders situated in different geographical regions. These stakeholder groups have different expectations as to the language, content, and approach of communication. For example, while investors in London might prefer objective and quantifiable data presented in detailed and plain English language, impacted communities in South America might expect concise, qualitative Spanish statements about

mining contributions to their lives. As Figure 4-6 suggests, there seems to exist a conundrum in sustainability communications. Readers have different and conflicting needs in terms of “effective” and “objective” communication. Achieving a balance among these needs might not be feasible in a single report, given the plurality of stakeholders that they deal with.



**Figure 4-6 - The Seesaw Conundrum in Sustainability Communication**

Aware of this conundrum, Malen Baker argues that the future of sustainability reporting will be one of a plurality of channels of communication:

*We will see datastreams going from companies directly into the spreadsheets of analysts, with expert third party commentators then providing the context as to what those figures mean. Completely separately to that, companies will have established effective communication mechanisms with their direct stakeholders - customers, employees, local communities, which establishes a dialogue about issues. The thing that this future suggests is no single report. (Baker, 2008, no page number)*

The growing number of site-level reports or region-based reports among mining corporations seems to corroborate this trend. Chapter Six will elaborate on the challenges involved in transforming this trend into common practice.

#### 4.4.7 *Broad Participation*

*To strengthen their legitimacy and relevance, sustainability assessments should:*

- *find appropriate ways to reflect the views of the public, while providing active leadership; and*
- *engage early on with users of the assessment so that it best fits their needs.*

The GRI G3 has 4 indicators covering stakeholder<sup>31</sup> engagement, which ask for a list of the groups consulted during the preparation of the report, the criteria for selecting them, and the topics that were raised. Moreover, two of GRI's principles for defining reporting content depend on stakeholder participation: materiality and stakeholder inclusiveness. Materiality is defined in the framework as those significant issues that could “substantively influence the assessment and decisions of stakeholders” (GRI, 2006b, p. 8). It follows from this principle that organizations that want to comply with the GRI need to identify reporting contents based on the perception of their stakeholders. The principle of “stakeholder inclusiveness” reinforces materiality, while requiring organizations to “identify its stakeholders and explain in the report how it has responded to their reasonable expectations and interests” (GRI, 2006b, p. 10).

The Bellagio Principle above to a large extent is promoted by the GRI G3 and also by the MMSS, which further corroborates the value of participatory reporting. Nonetheless, this practice has not been very effective. As the Figure 3-11 in Section 3.6.2 has shown, just about a third of the GRI-based reports published by mining and metals companies in 2009 met Application Level A, which means that most companies (about two thirds) are disclosing indicators that do not necessarily reflect the perceived “materiality” or priorities of stakeholders. But, even those companies that claim to be complying with the materiality principle are not necessarily capturing the perceptions of their stakeholders.

The interviewed mining practitioners raised a number of challenges involved in their engagements with stakeholders, which will be further discussed in Chapter Six. Among the most relevant is the existence of a knowledge gap with respect to the methods used for

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<sup>31</sup> Stakeholder is defined by GRI as those “(...) entities or individuals that can reasonably be expected to be significantly affected by the organization's activities, products, and/or services; and whose actions can reasonably be expected to affect the ability of the organization to successfully implement its strategies and achieve its objectives” (GRI, 2006b, p. 10).

identification, selection, engagement, and management of information collected from stakeholders. To overcome these gaps, organizations have been increasingly using additional reporting guidelines, particularly the ones published by AccountAbility in partnership with other institutions (AccountAbility, 2005a, 2008a, 2008b; AccountAbility/BTGroup/LRQA, 2006). The use of the AccountAbility Series among the world's 250 largest companies has increased from five percent in 2005 to ten percent in 2008 (KPMG, 2008, p. 30). Yet most GRI reporters, including those from mining and metal companies, have been using a wide variety of rationales in their engagements, which undermine reports' comparability.

To comply with the GRI G3 framework, mining corporations can establish "any" sort of stakeholder engagement process. For example, they can either have two meetings in the head office during the year or ongoing, systematic communication processes throughout the mining sites, regional offices, and head office. Weak or strong approaches to capturing stakeholder's perceived sense of relevance will qualify as the "materiality test" needed to get an A level in GRI. There has not been a study on how these materiality tests have been used in the mining sector. One of the interviewees shared his perspective on the state of the art:

*So what most companies do, they have different stakeholder groups that they are attentive to, that they get feedback from. They have internal stakeholders, that are maybe very knowledgeable on certain subject matters. And they can go out and hire external groups with expertise and come in [in the head office], and based on their input further evaluate what is material. So a materiality analysis often includes a review of what issues is popping up in the press, what issues of concern have been raised in the community level, what issue came up in the environmental impact studies that a company was required to do, etc. And those are all taken into consideration into the materiality analysis. And that's the basis of reporting. (MP-1)*

Overall, the six mining managers and directors suggest that these analyzes have been predominately top-down, in the sense that they are taking place in the head-office. But, they also suggest there seems to be a trend towards incorporating sustainability reporting issues in the many communication processes with stakeholders that regularly take place in mining sites, thus enabling the publication of regional or local reports. One interviewee, however, noted that these bottom-up processes may bring some complications to publication of the head-office organizational report:



*What happens if the different sites come up with different assessments of what is material for them? What happens then? Well, you know how in a corporation you are trying to drive and improve in all sites. Sometimes you are comparing sites, using benchmarks examples of best practice. If each site would have a different set of materiality factors, I can see that that would create a bit of a challenge in the corporate environment as well. (MP-3)*

This perception is an interesting one, because it suggests the maturing practice of sustainability reporting is gradually revealing that “sense of materiality” cannot be aggregated. That mining corporations will need to reconceptualise the assessment of their operations’ contributions to sustainability not around issues but multiple systems, as suggested above in Figure 4-5. What seems to be happening today is the fabrication of an overall sense of materiality across the whole organization in the head office. This is a rather controversial process that demands further investigation.

#### 4.4.8 Continuity and Capacity

*Assessments of progress towards sustainable development require:*

- *repeated measurement;*
- *responsiveness to change;*
- *investment to develop and maintain adequate capacity; and*
- *continuous learning and improvement.*

The Bellagio Principle above is largely promoted by the GRI G3, which requires organizations to report sustainability contributions on a “consistent and periodic cycle” (GRI, 2006b, p. 37). For most organizations, this cycle has been an annual one. Companies seek to publish sustainability reports along with their annual reports, and, more recently, inside their annual reports, also known as “integrated reports”<sup>32</sup>. This continual exercise of public disclosures has been translating into improvements in both the quantity and quality of sustainability reports. This is a undisputed conclusion across many of the surveys cited in this thesis, including the

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<sup>32</sup> While integrated reports account for a small fraction (about 3% among large corporations) (KPMG, 2008), it is likely to grow in future years (Eccles & Krzus, 2010).

ones addressing the mining sector (Deloitte, 2007; Jenkins & Yakovleva, 2006; KPMG, 2003, 2006b; Matthews, et al., 2004; Mudd, 2007b; Perez & Sanchez, 2009; PWC, 2007a).

One of the outcomes of this ongoing process of disclosures has been a growing demand for capacity-building and institutionalization of sustainability reporting in the fabric of mining companies. A Mining Practitioner “complained” that her work load has been increasing steadily (MP-5). She said that she needs to hire another analyst urgently to help her coordinate the report at the Head Office; otherwise she will not be able to cope with the demands. It is important to notice, however, that the continuous improvement of sustainability reporting is affecting not only the Head Offices’ Corporate Affairs and Corporate Responsibility and Sustainability departments (which usually coordinate reporting), but also a variety of departments in the operational sites. One of the directors interviewed during the research gave a sense of how many people are currently participating in the reporting process:

*(...) we have a Working Group where basically everybody is involved. We also have a Steering Committee which involves senior people to make big decisions, and of course people in operations to repeat data request and coordinate with their team who is going to provide the data. In the end of you have 80 people working on reporting in some capacity. If you have 15 different sites, you have at least 5 people contributing to data collection in some way. (MP-3)*

The extent to which learning has been an outcome of sustainability reporting is challenging to determine, as the Bellagio Principle above does not precisely define the type and modes of learning called into question. For example, one might argue that GRI reporting has not been able to promote double-loop learning yet, i.e. learning that restructures “values and fundamental assumptions built into an organization’s theory-in-use” (Argyris & Schön, 1996, p. xxiii). The issues-based rationale and the upbeat tone of the social and environmental reports of the 1980s and 90s are still present in sustainability reporting. Companies have been expanding the number of reported issues, consulting more stakeholders, seeking external assurance. But these changes have arguably come in reaction to updates in reporting frameworks, such as GRI’s and ICM’s. Very few companies have tried to go beyond the “traditionally observed” requirements of these standards and, for example, incorporate context-based disclosures.

#### **4.5 Towards More Meaningful and Reliable Reports of Mining Companies' Contributions to Sustainability**

Overall, the analysis and discussions of Section 4.4 reveal that mining corporations' approaches to sustainability reporting, as promoted by the GRI G3, partly meet the Bellagio Principles. The GRI framework guides mining companies to structure an assessment and reporting process that can meet several elements within the principles. Among others, the GRI G3 and its MMSS can promote the following positive aspects in the assessment and reporting process:

- sustainability as a vision;
- need to contextualize performance in relation to the carrying capacity of ecosystems;
- consideration of a wide range of sustainability dimensions covering governance, eco-efficiency, human rights, economic impacts, product responsibility, etc.
- awareness of the technical difficulties and potential dangers of aggregating data across sites;
- reliability and external verification;
- stakeholder participation;
- benchmarking and standardization;
- links between sustainability goals and performance; and
- continuous improvement.

The GRI is undisputedly adding a wide range of sustainability issues, principles, and processes for the consideration of mining corporations that were previously overlooked. This explains why many interviewees, while concurring on the existence of limitations and problems in the GRI framework, believe that the existence of the framework is in itself a motive to celebrate.

As one of the interviewed researchers said: "I like the fact that it [GRI] exists, that they [mining companies] have a framework in place that reflects a multi-stakeholder process, that

organizations can turn to as a starting point to measure their sustainability performance” (RD-5). A consultant also noticed that the GRI framework helps them to provide services on sustainability reporting: “The fact that there is an international standard is in itself positive, and helps to break through the conservatism of our leaderships. Because when you approach them [corporate clients] saying ‘this is not something I’ve done’, but a global standard, they stop to listen to you!” (CC-2)

The problems of sustainability reporting among mining corporations “start” to emerge not only in the limitations of the GRI framework, but in its misuse. This misuse may be manifested through the “manipulation” of reported information. More clearly, it takes place through the lack of consideration (cherry-picking) of some of the framework’s requirements, such as the sustainability context principle, external verification, and careful aggregation and disaggregation of data. But even if mining corporations were to fully comply with the framework, this would be largely insufficient to structure a sustainability assessment and reporting process that could meet the analysed Bellagio Principles.

The GRI approach to assessing and communicating mining contributions to sustainability has a variety of gaps within each of those principles. The gaps in connection with the principles on Transparency, Effective Communication, Broad Participation, and Continuity and Capacity are arguably easier to address, as current reporting practices already take into account many of the elements in those principles. The gaps related to Essential Considerations (holism), Adequate Scope, and Framework and Indicators entail more challenging objectives to be fulfilled, as they demand substantial changes in the way mining companies frame their assessments. Table 4-6 below highlights the most relevant changes that can help fill those gaps.

**Table 4-6 - Required Changes in Mining Corporations' GRI-based Sustainability Reporting Frameworks**

<b>Assessment and Reporting Elements</b>	<b>Current GRI-based Practice</b>	<b>Desirable Practice</b>
<b>Vision</b>	Sustainability, overlooking the need to operate within the capacity of the biosphere	Sustainability, respecting the need to operate within the capacity of the biosphere
<b>Conceptual Framework</b>	Tacit, non-systemic and issues-based	Explicit, geographically-based and scale-based
<b>Trade-offs and synergies among indicators and systems</b>	Overlooked	Assessed, justified, and explained
<b>Geographical Scope</b>	Weakly addressed	Implemented from local to global (facility-level, regional/national-level, and global-level reports)
<b>Temporal Orientation</b>	Predominantly retrospective	Retrospective and prospective, with scenario buildings or forecasting/backcasting techniques, allowing understanding of legacy effects
<b>Types of indicators</b>	Non-integrated. Mostly pressure and response	Non-integrated and integrated, addressing pressure, state, and response, and the relationships among them
<b>Disclosures of assumptions and uncertainties</b>	Limited	Thorough
<b>Reporting or Communication</b>	Visually appealing, upbeat tone, concise and extensive narratives, with little external verification.	Plain language, visually appealing, multiple languages, formats and approaches, quantitative and qualitative, externally verified
<b>Public Participation</b>	Uncommon, top-down, company-led	Common, top-down and bottom-up, systematic with third-party mediation

The relevance of some of the changes proposed in Table 4-6 has already been highlighted in previous studies. However, few studies have addressed these issues in the context of mining or have based their analyses on a range of widely endorsed principles on sustainability assessment and reporting. The changes proposed in Table 4-6 are perhaps the most updated and comprehensive yet proposed for mining corporations. Companies, industry associations, standard-setters and policy-makers will find in Table 4-6 a set of leverage points towards better sustainability reports.

The potential benefits of promoting some of the key changes above were communicated to the interviewees for the purpose of starting to explore the barriers that may emerge in their implementation. The plurality of opinions and perspectives will be further described in Chapter Six. Some interviewees, like Roberto Villas-Bôas, a researcher of mining sustainability indicators and frameworks (Villas-Bôas, 2006, 2009; Villas-Bôas, et al., 2005), endorsed the relevance of elements such as systems approach, integration of sustainability dimensions, justification of trade-offs, and scenario buildings. Villas-Bôas emphasized that all elements are important, but “depending on the given situation, one or the other point should be stressed more, here and there. But all [elements should be] there” (ME-1).

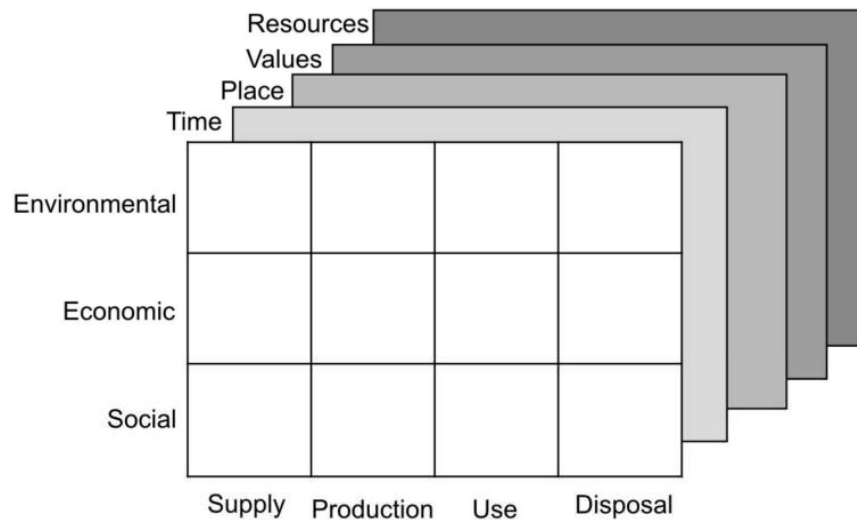
Many scholars and institutions are pushing for some of the changes prescribed in Table 4-6. Mark McElroy, from Deloitte’s Center for Sustainability Performance, is particularly concerned with reporting organizations’ disregard for the Sustainability Context principle, i.e. with the disregard for the need to operate within the capacity of the biosphere. McElroy reviewed hundreds of reports and did not see “one that adheres to this most basic of principles. Even GRI itself, in publishing its own sustainability reports, fails to do so” (McElroy, 2008). McElroy and others argued that “while it is true that GRI advocates for *sustainability context* in the preparation of reports, it completely fails to provide guidance for doing so, thereby ensuring that most GRI reports will be virtually context free!” (McElroy, et al., 2008, p. 223) In reaction to this gap, McElroy and his colleagues developed a number of methodologies that enable measurements of sustainability performance that take into account the socio-environmental context. One of these methodologies was dubbed the *True Sustainability Sustainability Index<sup>TM</sup>* (CSI, 2009; CSRwire, 2009).

Professor Adisa Azapagic was more concerned with reporters overlooking the fact that sustainability is “a holistic concept and ideally we should strive to consider all three pillars of sustainability simultaneously” (Azapagic, 2004, p. 656). She proposed a GRI-based sustainability framework for mining and metal companies that filled, to a certain extent, the gaps of integrated indicators. Her framework included many aggregated metrics linking, for example, environmental and economic issues, and social and environmental issues.

More recently, Rodrigo Lozano and Don Huisingh (2010), elaborated on Azapagic's work, while undertaking an analysis of whether the sustainability reports of three mining and metals companies were addressing economic, ecological, and social issues separately or in an integrated and inter-linked manner. Surprisingly, the analysts found that the three companies, although not required by the GRI framework to do so, were disclosing performance on a few indicators with due considerations for their relationships with other dimensions. But the authors argued that those disclosures were largely insufficient for integrative decision-making and, therefore, called for a far more robust approach to disclosing synergies and trade-offs within indicators. Such a requirement was recently taken into consideration in the impact assessment of a proposed mining project – Kerness North Project – in Canada. The joint review panel based their decision on a framework that clearly specified sustainability criteria, the need for integration and long-term timeframes (Fonseca & Gibson, 2008).

Arun Basu, Uday Kumar and Gavin Hilson (2004; 2003) proposed another sustainability framework for mining companies that considered not only integration, but also a wider role for stakeholder engagement. They argued that stakeholders should participate not only in the identification of “material” indicators, but also of technologies and governance models.

Consultant Beth Beloff and others (2004) have realized the need for a more holistic conceptual framework for business corporations. Their proposed conceptual framework (Figure 4-7) adopts a comprehensive multiple-lenses approach to corporate sustainability that recognizes life cycle stages and temporal and spatial scales. In line with the Bellagio Principles, the framework proposed by Beloff and others argues for a sustainability assessment made up of various sub-assessments covering different spatial boundaries, timeframes, social/cultural values and types of natural resources.



**Figure 4-7 - Multiple Lenses-based Conceptual Framework of Corporate Sustainability**  
Adapted from Beloff and others (2004).

The works above indicate that scholars and institutions (including mining companies and associations) are already trying to promote some of the changes highlighted in Table 4-6. Most of these efforts, however, are focusing on one or a few of the proposed changes. This is understandable, because, altogether, those changes can be too technically demanding for a single institution or program to address. But given that the Bellagio Principles are “interrelated and are intended to be used as a complete set” (IISD and OECD, 2010, no page number), it is yet to be understood whether this reductionist approach to enhancing sustainability assessment and reporting can result in meaningful progress. The following chapters will contribute to understanding this problem, while identifying the barriers to promoting those changes and evaluating the potential consequences of addressing just one or a few of them.

#### 4.6 Conclusion

“As things currently stand, we believe we must treat the current crop of ‘sustainability reports’ with the profoundest mistrust as one of the most dangerous trends working against any possibility of a sustainable future” (Gray & Bebbington, 2007, p. 386-387). This quotation epitomizes the “exaggerated” view of a growing scholarship on social and environmental accountability that is concerned with the current approaches to assessing and reporting corporate contributions to sustainability. A special issue of the *Accounting Forum* journal



recently gathered a number of scholars that concur with Gray and Bebbington, while calling for more holistic, systems-based, pluralistic, approaches to sustainability reporting (Bebbington, 2009; Frame & Cavanagh, 2009; Gasparatos, et al., 2009; Russell & Thomson, 2009; Xing, et al., 2009).

To a certain extent, this research corroborates such views, while identifying significant weaknesses in the predominant approaches to sustainability reporting among mining corporations. It has done so by analysing the limitations of the GRI framework used and misused by these companies. The analysis was based on literature reviews, interviews, and GRI documents published by mining companies. A number of changes in the assessment and reporting process were highlighted as needed for promoting more meaningful disclosures of contributions to sustainability.

In spite of the identified problems, it should be noted that the fact that there is something such as a sustainability reporting framework being used by global mining corporations at all is something that is worth consideration. Twenty years ago, this type of language and thinking was a concept known only to a small group associated with environmental concerns. Making mining companies aware that sustainability is a concept that needs to be taken into account – and measured – in their operations is no small task, especially considering that it was achieved over a timeframe of about a decade. Sustainability reporting still has notable flaws that frustrate analysts such as Gray and Bebbington, who argue that this practice has mostly been enabling “greenwashing” rather than transparent disclosures of sustainability performance. However, GRI reporting is helping to ensure that the sustainability subject is incorporated into mining corporations, thus challenging their traditional business practices. The next step is to take advantage of this momentum, and strive to design more sound and reliable sustainability assessment and reporting processes.

Challenges abound. There is currently a lack of connection between guidance and practice. The analyzed GRI G3 promotes a number of relevant principles that are not being fully observed. Perhaps no mining company has yet tried to systematically and consistently apply the Sustainability Context principle, despite it being one of the four principles for defining

contents. Other principles, like stakeholder inclusiveness and materiality, are still uncommon among the majority of reporters. This situation raises questions as to whether mining companies need more guidance on those principles or whether they should be enforced to apply them.

But the greatest challenges seem to emerge because of the limitations of the GRI G3. For example, this analysis has shown that, for the purpose of meeting the desirable requirements of an effective sustainability assessment and reporting process, the framework would need a better conceptualization of space. The GRI G3 adopts a controversial issues-based approach to understanding progress towards sustainability that largely fails to capture the interactions of mining corporations with the environment. “Fixing” this situation would mean promoting profound changes in the structure of the assessment and reporting process.

The avenues for enhancing these processes are wide open for exploration. Section 4.4.4 has suggested a possible systems-based conceptual framework for this process that is more likely to result in meaningful “sets” of information about the role of mining corporations’ many operations in sustaining socio-ecological systems. But further research is needed. What are the potential costs involved in the operationalization of such a robust systems-based framework? Are there enough data in the “real world” to feed such an assessment and reporting process? If not, who should be responsible for generating new data? To what extent should stakeholders participate in the definition of systems, design of indicators, etc.? These are just a few of the many questions that can emerge during the implementation of a more robust sustainability reporting.

This chapter has highlighted a number of scholars and institutions that are starting to address these questions. The next chapter will try to understand the potential implications of one of the most recent examples promoted by the aforementioned International Council on Mining and Metals. ICMM has recently started to enforce and standardize external verification among its membership with a new procedure. Understanding the impact of that procedure is relevant because ICMM’s programs can directly influence the sector’s largest companies and indirectly the whole sector.

## **Chapter 5 External Assurance: Nibbling at the Margins?**

### **5.1 Introduction**

Communicating sustainability performance in the mining sector is challenging. The nature and the image of the mining business predispose some stakeholders to distrust mining corporations when it comes to promoting sustainability. Mining operations can only be sustained while the extraction of finite mineral bodies remains technically and economically feasible. This facet of mining has frequently led to allegations that the industry “is inherently unsustainable” and that a “truly sustainable global society will take fewer minerals from the earth each year (...).” (Young & Septoff, 2002, p. 1) As noted earlier, mining companies have been involved in many human rights violations, corruption scandals, and tailing dam accidents, which triggered the emergence of anti-mining groups questioning that sector’s ability to behave sustainably. Furthermore, scholars are constantly scrutinizing mining corporations’ social and environmental efforts (Garvin, et al., 2009; Hills & Welford, 2005, 2006; Hilson & Haselip, 2004; Macintyre, 2007; Perez & Sanchez, 2009; Sethi, 2005; Sethi & Emelianov, 2006).

It is partially this added scrutiny and pressure that has been driving mining and metal corporations to be one of the most active actors in sustainability reporting (CorporateRegister.com, 2008b), and, now, to pursue standardized external assurance. As mentioned in Section 3.6, the ICMM recently launched an assurance procedure that is expected to promote more frequent and better quality external assurance among its member companies. Since 2003, that Council’s Sustainable Development Framework (SDF) includes a set of ten principles, GRI reporting, and external assurance, with which member companies are expected to comply. While companies have been implementing GRI reporting, few are fully complying with that framework and hiring external assurance to verify their reports.

The purpose of the ICMM Assurance Procedure is in a sense to help to address some of the problems previously mentioned in Chapter Four. The procedure is supposed to enforce and

standardize the implementation of external verification, which has been encouraged both by ICMM Principle 10 and by the GRI G3.

This chapter elaborates on the previous one and answers objective 2.2. As previously discussed, mining corporation current approach to sustainability reporting is marked by many weaknesses. But could external assurance help mining corporations and their stakeholders to overcome them? The overarching goal of this chapter is to better understand this question. More specifically it sets out to explore “What is the quality of external assurance under ICMM’s requirements?” and “To what extent can the new ICMM Assurance Procedure enhance assurance and promote trust in mining companies’ reported contributions to sustainability?” The chapter begins by presenting recent trends in external assurance and describing the ICMM Assurance Procedure. It then explains the methodology used to analyze the assurance practice and the potential implications of that procedure. Results and discussions are finally presented.

## **5.2 Mistrust in Sustainability Reporting: A Case for External Verification?**

### *5.2.1 The Standardization of Sustainability Assurance*

Accompanying the development of sustainability reporting have been discussions of the extent to which readers can trust reported data. Many of these discussions stemmed from the aforementioned fact that reporting companies have had substantial room for manoeuvring the delivered message and portray optimistic views on their sustainability efforts. This situation evolved to allegations of greenwashing (Henriques, 2007, p. 89), making evident what has been called the “credibility gap” in sustainability reporting (Dando & Swift, 2003; MacLean & Rebernak, 2007). “Stakeholders want to be sure that the report presents a fair picture and that it is actually more than just a PR [public relations] instrument” (KPMG, 2006a, p. 6).

Several tools can be used to enhance the credibility of reported information. These include external assurance, internal audits, information systems, and reporting standards. While each tool has particular strengths, external assurance is increasingly being seen as a critical one.

Between 1997 and 2007 the average annual growth rate in assurance statements appearing in sustainability reports was 20% (CorporateRegister.com, 2008a). These numbers corroborate the view that assurance “represents the next stage of development in sustainability reporting as approaches become more developed and demand of report-users more sophisticated” (ACCA, 2004, p. 16). Many organizations, notably those from the accounting and consulting fields, have been arguing that assurance is fundamental to increase trust in sustainability reporting (Bureau Veritas, 2009; KPMG, 2006a; PWC, 2007b; SGS, 2008).

Assurance has been defined as

*the methods and processes employed by an assurance provider to evaluate an organization's public disclosures about its performance, as well as underlying systems, data and processes against suitable criteria and standards in order to increase the credibility of public disclosure.* (AccountAbility, 2008b, p. 23)

In spite of the growing application of these methods and processes to sustainability reporting, this practice still seems to be “at the stage that financial auditing achieved 150 years ago” (Henriques, 2007, p. 80). A variety of conceptual, practical, and theoretical questions in connection with sustainability assurance remain unanswered. For example, a number of different terms, such as audit, verification, and validation, have been used to describe this practice (Gray & Bebbington, 2000). As Zadek and others have noted, “(...) this mixture of terms reflects the different approaches to assurance currently undertaken.” (Zadek, et al., 2004, p. 29)

While the concept of assurance is rooted in the financial realm, environmental consultancies and civil society institutions have also been providing sustainability assurance services, thus bringing more texture to the field. In 2002, the Fédération des Experts Comptables Européens identified five different approaches to providing assurance on sustainability information. These included the accountancy, social audit, consultancy, rating agency, and expert statement (FEE, 2002, pp. 18-21). The accountancy and consultancy are currently the predominant ones (CorporateRegister.com, 2008a, p. 24). Each of these approaches has particular principles, definitions, and criteria for verification, but they also share a number of similarities.

The accountancy approach distinguishes itself by following the International Standard for Assurance Engagement (ISAE) 3000, which establishes principles and procedures for professional accountants in public practice of assurance engagements other than audits or reviews of historical financial information (IFAC, 2008, p. 923). This standard requires accountants to state the level of assurance, which can be either “reasonable” or “limited”. Reasonable assurance is given in positive form when the engagement provides a reduction in the risks of errors or omissions in the assured information to low levels. Limited assurance is given in a negative form when the reduction of those risks is moderate. The overall majority of accountants have been providing limited assurance on sustainability information ones (CorporateRegister.com, 2008a, p. 13). Positive statements are believed to build more trust. A positively framed statement reads as follows: ‘The reported sustainability data accurately reflect the company’s performance during 2006/2007.’ Statements framed in negative manner reads differently: “Nothing has come to our attention which causes us to believe that the reported sustainability data do not accurately reflect the company’s sustainability performance during 2006/2007”.

The consultancy approach is more diverse, as its professionals are not required to comply with a particular standard. However, a recent study by CorporateRegister (2008a) found that consultants tend to give positive assurance conclusions, make more recommendations, and use the AccountAbility 1000 Assurance Standard (AA1000AS). This standard, launched in 2003 by AccountAbility and currently in its second version, is based on the principles of inclusivity and responsiveness to stakeholders’ concerns (AccountAbility, 2008a, 2008b). The AA1000AS also adopts the principle of materiality, but with a stakeholder orientation. The standard advocates that the definition of “material scopes” should be based on stakeholder consultations; whereas, in the ISAE 3000, the responsibility for defining materiality lies largely with reporters and assurers (Lansen-Rogers & Oelschlaegel, 2005). The AA1000AS also requires assurers to state the level of assurance, which can be “high”, “moderate” or a combination of both. It has been argued that the combined use of AA1000AS and ISAE 3000 can deliver more valuable assurance (Lansen-Rogers & Oelschlaegel, 2005).

The ISAE3000 and the AA1000AS have brought some progress to the field of sustainability assurance, but there is still a need for better standards (FEE, 2006). How much confidence should assurance convey? Which assurance criteria should be used? These are just a few among the various questions being debated.

Previous studies on the quality of sustainability assurance have consistently found a great deal of ambiguity and diversity in criteria and scope (Ball, et al., 2000; CPA, 2004; Deegan, et al., 2006; Kamp-Roelands, 2002; Kolk & Perego, 2009; Mock, et al., 2007; O'Dwyer & Owen, 2005; Owen, 2007; Owen & O'Dwyer, 2004; M. J. Wilson, 2003). Most importantly, they have been questioning the degree of independence of assurance practitioners, as there has been evidence of substantial auditee control over the practice. As David Owen said, “the simple fact is that assurance providers are appointed by management, who can place any restrictions they wish upon the exercise” (Owen, 2007, p. 177). Assurors are, in turn, tailoring their services to reporters’ needs. The SGS Group (SGS, 2008) and the Bureau Veritas (2009) are, for instance, offering a staged assurance service in which addressing stakeholder’s needs is the most “advanced” service.

Brendan O’Dwyer and David Owen (2007) revisited the problem of assurance quality recently and found, among other problems, a continuing absence of stakeholder involvement and a tendency to minimize expectations through extensive scope limitations. To date, assurance seems to be working more like an internal management tool to tackle specific risks and issues, rather than a practice to enhance transparency and sustainability accountability to external stakeholders. Assurance has, ironically, been lacking credibility as a tool to increase credibility.

### *5.2.2 ICMM Assurance Procedure*

The Assurance Procedure recently launched by ICMM is supposed to be used by mining companies and assurors in order to overcome some of the aforementioned problems. The procedure was based on the GRI G3 framework and on the AA1000AS and ISAE 3000

standards (see Figure 5-1) It is not intended, however, to replace them (ICMM, 2008b). Its main objective is to ensure that member companies adopt a consistent approach to external assurance. In doing so, the procedure provides requirements and practical steps in connection with the key elements of an assurance engagement. Many requirements were drawn from the aforementioned standards, but some are unique. Among these is the specification of five minimum subject matters to be verified by assurers.

<b>10 Principles</b>	<ul style="list-style-type: none"> <li>- Implement and maintain ethical business practices and sound systems of corporate governance.</li> <li>- Integrate sustainable development considerations within the corporate decision-making process.</li> <li>- Uphold fundamental human rights and respect cultures, customs and values in dealings with employees and others who are affected by our activities.</li> <li>- Implement risk management strategies based on valid data and sound science.</li> <li>- Seek continual improvement of our health and safety performance.</li> <li>- Seek continual improvement of our environmental performance.</li> <li>- Contribute to conservation of biodiversity and integrated approaches to land use planning.</li> <li>- Facilitate and encourage responsible product design, use, re-use, recycling and disposal of our products.</li> <li>- Contribute to the social, economic and institutional development of the communities in which we operate.</li> <li>- Implement effective and transparent engagement, communication and independently verified reporting arrangements with our stakeholders.</li> </ul>
<b>Reporting</b>	<ul style="list-style-type: none"> <li>- G3 GRI guidelines</li> <li>- GRI Mining and Metals Sector Supplement</li> </ul>
<b>Assurance</b>	<ul style="list-style-type: none"> <li>- ICMM Assurance Procedure</li> </ul> <div style="display: inline-block; vertical-align: middle; margin-left: 10px;"> <ul style="list-style-type: none"> <li>- ISAE 3000</li> <li>- AA1000AS</li> <li>- G3 GRI guidelines</li> </ul> </div>

**Figure 5-1- Detailed ICMM Sustainable Development Framework**

The procedure also specifies key management actions that assurance providers should consider – as simple guidance – when verifying the ten principles presented in Figure 5-1. Reporters can hire services from accounting, consulting or stakeholder firms, as long as these organizations can demonstrate independence and competency (ICMM, 2008b). Mining companies, at the time of their engagement in ICMM, had committed to hire external assurance, which has been promoted by the SDF and its GRI element since 2003. The procedure’s main purpose is to enhance and harmonize assurance within ICMM. Member companies have until the financial year ending March 2010 to comply with the procedure.



### 5.3 Content Analysis of Assurance Statements

The evaluation of the first research question driving this chapter (What is the quality of external assurance under ICMM’s requirements?) was based on a cross-sectional content analysis of assurance statements appearing in sustainability reports. Statements are the main vehicle for communicating assurance to stakeholders. Ranging from one to a few pages, they carry not only findings and conclusions, but also limitation of scope, criteria for verification, details of the firm and respective team providing assurance, among others. An evaluation of such information can reveal the extent to which the assurance met “best practices”, which, in turn, indicates its potential capacity to add credibility.

The analysis of statements has been common in previous studies on the quality of non-financial assurance. The evaluative frameworks used in those studies had their elements drawn from the recommended minimum contents of assurance statements pointed out by reporting standards and guidelines. This chapter followed the same rationale. The adopted framework, presented in Table 5-1 sets the key minimum elements, as well as the criteria for distinguishing between “low quality” and “high quality” statements.

**Table 5-1 - Statements Analysis Framework**

<b>Contents of statements</b>	<b>Low quality</b>	<b>High quality</b>
Scope of engagement	Unclear or vague	Clearly stated, encompassing key sustainability issues
Addressee	Not included or addressed to internal audience	Addressed to all stakeholders
Responsibilities of reporter and assesor	Not included or appear as legal disclaimer	Clearly stated
Competency of assesor and respective team	Not included	Clearly stated
Independence of assesor	Not included or vague	Clearly stated
Level of assurance	Not included	Clearly stated (e.g. limited, reasonable, combined)
Assurance standards used	No specific references	Clearly stated (e.g. ISAE 3000, AA1000AS)
Methods and criteria used to assess evidence and reach conclusions	Not included or vague	Clearly stated (e.g. disclose interviewees, sites visited)

Conclusion / Opinion	Generic, negative statements	Specific, narrative, positive and addresses the principles of materiality, completeness/inclusiveness, and responsiveness
Recommendations or additional comments and observations	Not included	Clearly stated

Source: Adapted from O'Dwyer and Owen (2005, 2007), AccountAbility (2008b), FEE (2002), IFAC (2004) and CorporateRegister.com (2008a).

To test the extent to which ICMM company members' statements met Table 5-1's "high quality" contents, the thesis considered a sample of assurance statements drawn from the most updated sustainability reports that were publicly available between November and December 2007 on the websites of ICMM member companies or in open databases of sustainability reports, such as *CorporateRegister.com*'s (Alcoa, 2007; Anglo American, 2007; Ashanti, 2007; BHP Billiton, 2007; CVRD, 2007; Gold Fields, 2007; Lonmin, 2007; Mitsubishi Materials, 2007; Newmont, 2007; Nippon, 2007; Rio Tinto, 2007; Sumitomo, 2007; Teckcominco, 2007; Xstrata, 2007; Zinifex, 2007) At that time, the new Assurance Procedure had not been launched. The evaluation of ICMM Assurance Procedure considered whether it can fill the identified gaps, and if this is sufficient to promote trust in mining companies' reports. All types of external assurance were evaluated, regardless of whether they were named as external or independent "audits" or "verifications".

### 5.3.1 Quantity and Overall Description of the Analysed Assurance Statements

Nine out of the sixteen companies<sup>33</sup> that had membership in ICMM during the analysed period included an assurance statement in their respective reports. This proportion (56%) of externally verified sustainability reports in the group, while significantly higher than the global average of about 25% (CorporateRegister.com, 2008a), can be regarded as low, given that all companies were expected to seek assurance in accordance with the SDF.

<sup>33</sup> ICMM has, since 2007, incorporated 3 more members.

Future years are likely to see an increase in assurance. Companies, such as Gold Fields (2007, p. 93) and Teck (2007, pp. 10-11), reported that they are working towards external assurance. The following report published by Teck was, in fact, externally verified (Teck, 2010). Although being a member of the ICMM at that time, one of the analysed companies stated in its report that it would not seek assurance, as there has not been a “single credible source of verification that will satisfy every individual stakeholder group” (Alcoa, 2007). This company has recently withdrawn its membership from the Council.

The nine analysed statements (Table 5-2) ranged from one to four pages and were signed between November 2006 and September 2007. There was almost a balance between types of assurance providers: four accounting firms and five consultancies. The extent to which each statement met the “high quality” recommended contents is presented in the Appendix 3 and discussed below.

**Table 5-2 - Analysed Assurance Statements**

<b>Company</b>	<b>Title</b>	<b>Provider</b>	<b>Date</b>	<b># Pages</b>
Anglo American	Independent Assurance Report	KPMG LLP	30-Mar-07	2
AngloGold Ashanti	Report of the Independent Assurers	PricewaterhouseCoopers	01-Mar-07	1
BHP Billiton	Independent Limited Assurance Statement	Ernst & Young	04-Sep-07	4
Lonmin	KPMG’s Independent Assurance Report	KPMG Services (Pty) Limited	23-Nov-06	2
Newmont	2006 Assurance Statement	World Monitors Inc	02-May-07	*
Nippon Mining and Metals**	Comments from the Third Party	Atata Sustainability Attest Organization Inc.	24-Aug-07	1
Rio Tinto	Environmental Resources Management Statement	ERM Environmental Resource Management Limited	01-Feb-07	1
Xstrata	Independent Assurance Statement	URS Verification Limited	01-May-07	1
Zinifex	URS Verification Statement	URS Verification Limited	12-Dec-06	1

\* Newmont’s sustainability report and its respective assurance statement were made available online without page numbering (Newmont, 2007). \*\* Nippon’s report and statement were published in Japanese. The document was translated to English language by a professional translator.

### 5.3.2 Scope and Subject Matter

The assurance scope was presented in all nine (100%) statements. In eight of these (89%), the information that was not verified was clearly indicated. All statements mentioned that the assurance covered “selected” data, targets, processes or controls, but the extent to which such selection was specified varied substantially. For example, three (33%) statements did not provide any information about the “selected” data. Three (33%) indicated the categories (e.g. safety, social, environment) from which the data were drawn; and three (33%) disclosed not only the categories, but the specific indicators that were addressed. The data selection was briefly explained in two statements claiming that the data represented “key sustainability risks” or “performance priorities”.

The most referenced subject matter was compliance with the GRI guidelines, which was mentioned in five (56%) statements. Three (33%) of these five also made reference to the GRI Mining and Metals Sector Supplement. Surprisingly, none of the assurers mentioned the principles of the ICMM in their verified scopes.

One clear outcome of the ICMM Assurance Procedure will almost certainly be to bring more consistency and breadth to the verification of subject matter, as it requires assurers to disclose in the scope of their statement “a description of the selected subject matter required by ICMM”, which includes the following:

- *the alignment of a member company’s sustainability policies to ICMM’s 10 sustainability principles;*
- *the company’s material sustainability risks and opportunities;*
- *the existence and status of implementation of systems and approaches that a company is using to manage each (or a selection) of the identified material risks and opportunities;*
- *the company’s performance during the given reporting period for each (or a selection) of the identified material risks and opportunities;*
- *the company’s self-declared application level of the G3 Guidelines. (ICMM, 2008b, p. 6)*

Previous studies found that assurers have been downplaying stakeholders' expectations by extensive limitation of the scopes of their investigation (O'Dwyer & Owen, 2007) . By setting a minimum scope that goes beyond the topics addressed in current practice, ICMM might increase the value-adding of assurance among its members.

### *5.3.3 Intended Audience*

While six (67%) statements explicitly defined the intended audiences, these included only the company or its internal management bodies. Such findings are consistent with previous studies, which highlighted that assurers have been reluctant to address the statements to all stakeholders (CorporateRegister.com, 2008a). The need to address all stakeholders is important because sustainability reports, such as the ones published by ICMM member companies, are being written to meet the information needs of internal and external stakeholders. Since the ICMM Assurance Procedure does not have specific requirements for the disclosure of an intended audience, there is no evidence to suggest that there is likely to be future improvements on this issue.

### *5.3.4 Assuror's Responsibility, Qualifications and Independence*

Eight (89%) statements contained a brief description of the responsibilities of reporters and assurers. Four (44%) statements also made references to the qualifications and experience of assurance firms, as recommended by the ISAE 3000 (IFAC, 2004, p. 925) and AA1000AS (AccountAbility, 2008b, p. 22). Only one document, however, disclosed a detailed (names and respective backgrounds) description of the individuals of the assurance team. While the ICMM Assurance Procedure sets generic competence requirements for individuals and organizations providing assurance to company members, it does not require that such information be disclosed in the statement.

References to assessor independence from the mining company were found in eight (89%) statements, but in two of these the reference was simply made in the title of the document. The analysis of statements prepared by the same assurance firms indicated ambiguities related to the specification of the degree of independence. One particular assessor, for example, made no reference to independence other than the title in one statement, but included an extensive description of its independence when providing assurance to a different company.

The criteria used to demonstrate independence were somewhat questionable. Two assessors described their independence in spite of acknowledging that they had commercial relations with the mining company. In one case, the assessor explained that the revenue from that relationship was insignificant. In another case, the justification was based on different grounds: “During 2006/7 we have worked with Rio Tinto on other consulting engagements. However, we operate strict conflict checks to ensure that the independence of individuals involved in our assurance activities is not compromised” (Rio Tinto, 2007, p. 36). The ICMM Assurance Procedure might bring some progress to this issue, as it specifies five specific independence criteria for selecting assessors. Among these, is that “[assurance] providers should have no direct financial or material indirect financial interest in the assurance practice” (ICMM, 2008b, p. 16).

### *5.3.5 Assurance Level, Standards, and Methods*

The level of assurance was explicit in five (56%) statements. Two assessors provided “reasonable” assurance, one provided “limited”, and two provided both “limited” and “reasonable” on different reviewed data. As highlighted above, limitations of scope were pointed out in those statements without clear references to the assurance level. The ICMM Procedure is likely to enhance the disclosure of this element, since it requires providers to “clearly state (...) which level of reliability the statement is intended to convey”. The procedure further requires the following.

*Where a company's systems are not sufficiently mature to deliver reliable information and data for inclusion in the SD [sustainability] Report, it may not be possible to provide 'limited' assurance on some of the reported information and data. In such cases, the company should report how it intends to bridge any identified gaps and provide a timeframe within which it intends to do so. (ICMM, 2008b, p. 9)*

References to assurance or auditing standards used in the engagement were disclosed in six (67%) statements. Four (44%) assurers (all accountants) mentioned the ISAE 3000 standards, three (33%) referred to the AA1000AS, and one (11%) to the ISO 19011. The predominance of ISAE 3000 is in line with global practice (CorporateRegister.com, 2008a) and reflects the assurance leadership of accountancy firms, which are professionally required to adopt this standard. Only one statement made reference to both the AA1000AS and the ISAE 3000.

A comparison of two statements prepared by URS Verification adds evidence to the “adaptive” approach of current assurance providers. In one statement URS mentioned two standards, whereas in the other it made no references to standards at all. It is important to note that references to standards do not imply that assurers are fully observing their requirements. Ernst & Young, for example, when addressing BHP Billiton’s report left out a particular principle of the AA1000AS: “we did not consider responsiveness under AA1000, including attendance at any stakeholder engagement activities” (Rio Tinto, 2007, p. 65).

The ICMM Procedure does not have specific requirements for the disclosure of standards used in the engagement. However, the document was substantially based on the AA1000AS and ISAE 3000, thus implicitly encouraging companies to adopt them. Indirectly the procedure might boost references to those assurance standards.

Even though all nine (100%) assurers made references to the works undertaken during the engagement, there was a diverse approach to specifying such information. References to verifications of reported data and information collection systems/controls were found in nine (100%) and seven (78%) statements respectively. Site visits were mentioned by seven (78%) assurers, and interviews, by six (67%). Only one assessor (a consultancy firm) referred to interviews with external stakeholders. This situation corroborates the low level of stakeholder input in the assurance process pointed out by O’Dwyers and Owen (2007).

While the ICMM Procedure requires assurors to conduct interviews during their work, it only refers to internal management individuals. More external stakeholder-centric assurance practices are, therefore, unlikely to emerge as a result of this procedure. On the other hand, the procedure can have a positive impact on the breadth of the verification activities. After all, it states that the evidence gathering activities should occur not only in headquarters, but also in business units and site levels (ICMM, 2008, p. 8).

### *5.3.6 Opinions, Recommendations and Concluding Remarks*

Conclusions or opinions are one of the most important elements of the assurance statement. The type of opinion and the extent to which it addresses the criteria and scope are fundamental in conveying trust in reported information. It has been argued that “statements framed positively are more useful to external stakeholders than statements framed negatively” (CorporateRegister.com, 2008a). In the ICMM group, positive conclusions were found in the majority of statements (89%). One (11%) statement presented only negative opinions and two (22%) had both negative and positive. The correlation between type of opinion and level of assurance was clear. Negative opinions were only found in those statements that referred to limited assurance practices.

Because the Assurance Procedure does not require mining companies and assurors to adopt a specific level of assurance, future years are likely to keep seeing both positive and negative approaches. Progress can be expected, however, with respect to conclusions on the principles of materiality, inclusiveness/completeness and responsiveness, since the Procedure requires assurors to adopt these principles when verifying the minimum subject matter. In the ICMM group, conclusions addressing those principles were only found in the statements that were based on the AA1000AS, which accounted for 33% of the sample. It is important to note that KPMG when reviewing the report of the company Lonmin used the term “material” in a different sense from AA1000AS’s, that is, it referred to materiality without a stakeholder-based connotation (Lonmin, 2007).



Recommendations or additional observations were found in six (67%) statements. They were mostly describing weaknesses and strengths, suggesting particular improvements or commenting on mining companies' progress on reporting. Ernst & Young, for example, addressed the problem of boundaries in the BHP Billiton's report: "BHP Billiton defines its reporting boundary to exclude non-operated joint ventures, however, as a number of these entities are jointly controlled their exclusion does not meet the requirements of the GRI Boundary Reporting Protocol" (BHP Billiton, 2007, p. 67).

#### **5.4 Standardized External Assurance: A Trust Generating Tool?**

Overall, the analyses above revealed that the first experiences of external assurance in the ICMM group displayed low levels of stakeholder involvement in the assurance engagement, management-related addressees, few disclosures of assurance level and few conclusions on the principles of materiality, inclusiveness and responsiveness to stakeholders.

Most importantly, the analysis adds evidence to what Ball and others (2000) call the "managerial capture" of the verification process. The diversity of approaches to limiting scope and setting verification criteria within the group suggests that mining companies had significant control over the assurance engagement. In some cases, this was not merely suggested, but clearly stated: "Our responsibility, in accordance with BHP Billiton management's instruction, is to carry out a limited assurance (...)" (BHP Billiton, 2007, p. 64); "ERM's responsibility is to express our opinion on the content of the Review based on the scope agreed with Rio Tinto" (Rio Tinto, 2007, p. 36). As a mining-related sample, it would be reasonable to expect more references to that sector's specific issues in the verification scopes. However, only three assurers mentioned the GRI Mining and Metals Sector Pilot Supplement as a subject matter. Surprisingly, no references were made to ICMM's sustainability principles.

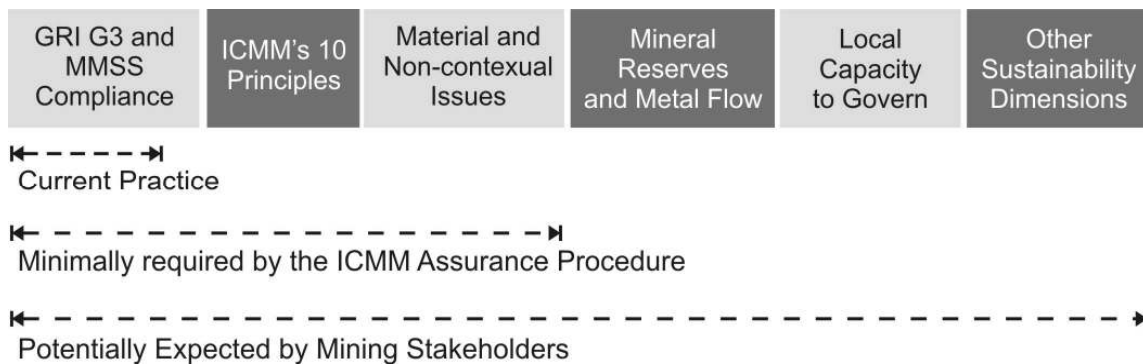
These findings indicate that the introduction of the ICMM Assurance Procedure is likely to bring more consistency and breadth to the verification of mining companies' sustainability

reports. The analysis of that procedure’s requirements and practical steps showed that it has the potential to fill many of the identified gaps, with a few, but relevant exceptions. Table 5-3 summarizes the key potential outcomes of that procedure.

**Table 5-3 - Potential Implications of the ICMM Assurance Procedure**

Assurance Statements in 2006-2007	Assurance Statements after 2010
Extensive scope limitations	Indicate minimum subject matter, including compliance with GRI G3, MMSS, and ICMM Principles
Diversity of analysis criteria	Compatible analysis criteria, based on the materiality and completeness principles
Few disclosures of assurance level	Frequent disclosures of assurance levels, but not necessarily of “reasonable” levels
Few conclusions on materiality, inclusiveness and responsiveness	Frequent conclusions on materiality, inclusiveness and responsiveness
Low comparability	High comparability

One of the most relevant limitations of the procedure is that it seems to be based on the assumption that readers expect verification of mining companies’ compliance with the GRI G3 framework, as well as with ICMM’s sustainability principles and the material sustainability risks and opportunities (Figure 5-2). The procedure does not necessarily require assurers to engage with external stakeholders to determine the scope and criteria of verification. Frequently debated issues in mining sustainability, such as the exhaustion of mineral reserves, metal flows, and the capacity of local institutions and governments to manage mineral revenues (Cowell, et al., 1999; World Bank, 2003), which are not necessarily addressed in the GRI framework or in the Assurance Procedure, might be expected by readers (See Figure 5.2).



**Figure 5-2 - External Assurance Scope**

Interestingly, the Assurance Procedure specified only two principles that should be necessarily used as criteria for verifying sustainability issues: materiality and completeness, both as defined by the GRI G3 and AA1000AS (ICMM, 2008, p. 6). Because it does not mention the other two GRI principles for the definition of content (Sustainability Context and Stakeholder Inclusiveness), the procedure may lead assurers to overlook them in their analysis. This is a relevant gap, because the lack of contextual disclosures in mining companies' reports, as Section 4.4.1 highlighted, has been one of the most significant problems in the practice of GRI reporting. Without context, reporting is unable to meet the Bellagio Principles.

It is unclear whether the ICMM Assurance Procedure can drive mining companies to develop new indicators and report beyond the GRI framework. Although the procedure also requires assurers to verify ICMM's principles and "company's material sustainability risks and opportunities", it is not clear whether these principles, risks and opportunities could be covered by GRI indicators or not. Forthcoming statements may shed light on how this issue will be interpreted by assurers. Future studies, therefore, should address the relative effectiveness of the outcome of the ICMM Assurance Procedure. Member companies are expected to comply with that document by the end of 2010. A comparative analysis of future statements with the ones presented here is likely to yield more insights on the role of industry standards in enhancing sustainability assurance and, ultimately, reporting.

By promoting more standardized verifications and more GRI-compliant disclosures, the procedure is likely to increase trust in mining companies' reports. Nonetheless, the extent to which it will happen will depend on the perceptions mining stakeholders hold of the GRI framework. After all, do readers believe that a fully-compliant GRI report is able to communicate contributions to sustainability?

Moreover, the meaning and implications of trust may vary substantially among stakeholders, nations, and cultures. Assessing degrees of trust as they relates to disclosures of sustainability (another "malleable" and contentious concept) might only be satisfactorily achieved with more focused and quantitative research methods addressing specific audiences. Future studies, like

the recent one from Kristy Hodge and others (2009), should explore the perception of particular stakeholder groups on the trust-generating potential of assurance statements.

## **5.5 Conclusion**

Despite public commitment, seven of the then sixteen ICMM member companies had not sought external assurance by the time this analysis was undertaken. The assurance provided to the remaining nine companies mirrored several of the problems highlighted in previous studies (Ball, et al., 2000; CorporateRegister.com, 2008a; Deegan, et al., 2006; O'Dwyer & Owen, 2005, 2007). In light of this situation, the introduction of the ICMM Assurance Procedure is likely to make external verification more common, inclusive and reliable within the ICMM group.

Another indirect outcome of the Assurance Procedure is to promote more GRI-compliant reports, given that GRI compliance was included in assurers' minimum verification scope. In doing so, the procedure will be helping to address one of the reporting problems identified in Chapter Four: the misuse of the GRI framework. This effect will probably be clearer within ICMM member companies as their membership depends on compliance with that procedure. But given that ICMM's work programs are promoted by more than 30 mining and mineral commodity associations, other mining and metal companies, not only large ones, might start to follow their peers' example.

These positive changes should promote trust in mining corporations' report. The extent to which it will happen will depend significantly on stakeholders' trust in a fully-compliant GRI report. As Chapter Four has shown, the GRI framework falls short of meeting a number of desirable requirements of effective sustainability assessment and reporting tools. These problems have been mostly perceived by scholars and, occasionally, by practitioners. But as more mining stakeholders become aware of these problems, more pressures are likely to emerge for reporting beyond that framework.

What seems to be missing in the mining sector is not so much a comparable approach for external verification, but a more effective framework of sustainability assessment and reporting. The development of such frameworks would enormously facilitate the work of auditors and verifiers. Yet this is definitely not an easy task. Chapter Six will elaborate on the many barriers to implementing more robust approaches to assessing mining contributions to sustainability.

## **Chapter 6 Barriers to Reframing Sustainability Reporting among Mining Corporations**

### **6.1 Introduction**

The growing uptake of the GRI framework among mining corporations has been driven in part by its potential benefits. Because of its flexibility and global reach, the framework opens opportunities to benchmark, compare, and communicate social and environmental efforts within the mining sector and across industries. The framework helps to manage corporate reputation and pursue competitive advantage. It is also relevant to mining stakeholders insofar as it provides a platform for dialogue with companies that can underpin a variety of purposes, such as ethical investing, political positioning, and academic research. These benefits are hardly disputed. What remains highly debatable, however, is how to strengthen the framework so that it can promote what it is supposed to promote, i.e. transparency of sustainability performance.

The previous chapter analyzed an initiative – the ICMM Assurance Procedure – that is meant to strengthen GRI reporting. Yet the analysis revealed that the procedure follows an “end of pipe” approach, while trying to ensure that the reporting process is aligned with the GRI G3, its MMSS and the 10 principles of ICMM. The procedure attempts to reinforce the GRI approach, rather than push for a “better” reporting framework. Given the several limitations of the GRI framework highlighted in Chapter Four, mining companies’ reports are likely to continue generating unreliable and questionable information about contributions to sustainability.

The imperfection of the GRI framework is acknowledged by the GRI institution itself, which embraces the principle of continuous improvement. Since its launch, the framework has been complemented by several sector supplements and gone through two major revisions: a pace that can be regarded as an impressive achievement, especially in comparison with other voluntary standards like the ISO 26000 (Watkins, 2008). Nevertheless, the extent to which GRI’s latest version, the GRI G3, represents a positive move forward remains debatable. The

existing problems in the framework call for a more robust structural change in the way GRI currently frames sustainability. This has been the main conclusion of Chapter Four and of a growing scholarship (e.g. Aras & Crowther, 2008; Archel, et al., 2008; Gray & Bebbington, 2007; Henriques & Richardson, 2004; McElroy, et al., 2008; Unerman, et al., 2007).

Most previous pieces of research, however, have not gone far beyond highlighting problems to understand the challenges involved in the implementation of the supposedly necessary changes. With the exception of a few studies identifying the existence of path-dependent factors and imbalances in GRI's governance system hindering significant improvements (H. S. Brown, Jong, & Lessidrenska, 2009; H. S. Brown, Jong, & Levy, 2009; Dingwerth, 2007), the barriers to strengthening the GRI framework remain largely unexplored.

The objective of this chapter is to further explore this gap. More specifically, it seeks to identify relevant barriers to implementing the changes raised in Chapter Four as necessary to strengthen the GRI framework among mining companies. Such an understanding will draw substantially on the semi-structured interviews described in Section 2.3.2.2, because little secondary data has been published about this problem.

This chapter is relevant not only to those involved in the design of GRI and its sector supplements, but also to other standard setters and policy makers. The “desirable” framework requirements discussed below have not been sufficiently tested elsewhere. The implementation barriers to those requirements can be informative for several types of institutions trying to improve other sustainability tools of a mandatory or voluntary nature. Individual organizations and industry associations searching for ways to enhance their particular approaches to GRI reporting may also benefit from this knowledge.

The chapter proceeds in three main sections. The following describes the methodological approach to analyzing the barriers to implementing changes in the GRI framework. The chapter then presents and discusses a diagram of the identified barriers, which were organized according to motivational, structural, and specific categories. Finally, Chapter Six draws some key conclusions.

## **6.2 Investigating the Key Barriers to an Enhanced Sustainability Framework**

### *6.2.1 A Hypothetical GRI-based Framework for Debate*

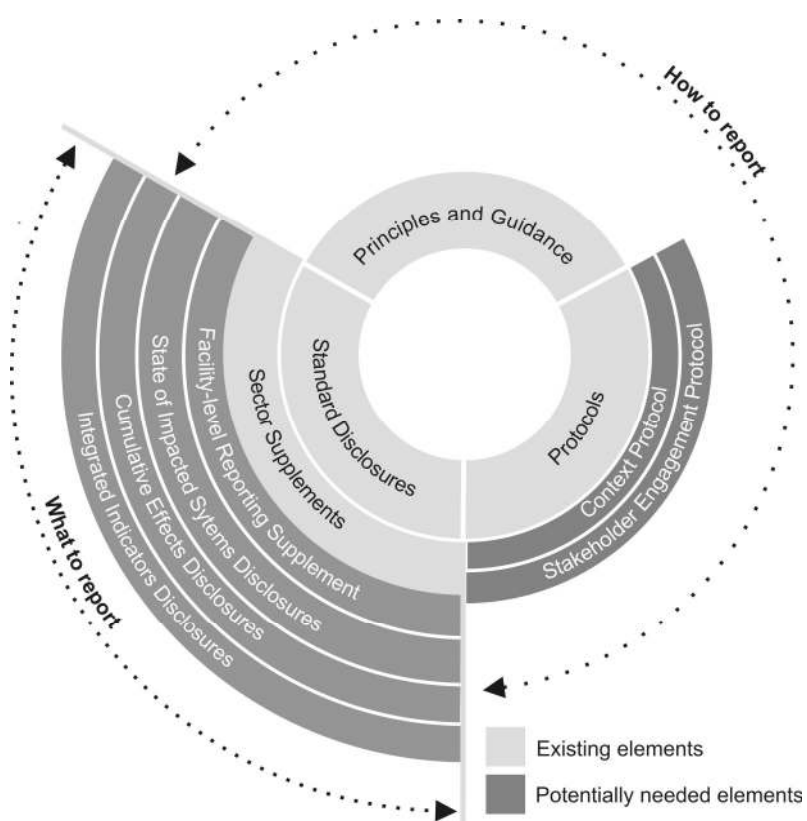
Section 4.5 outlined a number of changes (Table 4-6) that need to be implemented in mining corporations' sustainability frameworks to enable more reliable reports of contributions to sustainability. Although not numerous, those changes entail difficult technical solutions which can be promoted through numerous ways by different players.

During the research, it became clear that any attempt to understand the challenges involved in the implementation of those changes would depend on a more specific proposal of how they could be implemented. Instead of proposing an alternative framework to the GRI, this thesis explored the barriers to expanding and changing the current GRI G3, so that it could further meet the most relevant BellagioSTAMP principles. An evaluation of the barriers to a “new” framework would demand greater time and resources than the ones available. Many interviewees hold senior positions in their respective organizations. Counting on their participation for long periods of time would not be feasible.

Moreover, the pilot interviews revealed that the proposed changes to the GRI framework needed to be discussed in a conceptually simple way. The first attempts to discuss the need for holism, scales, and systems reasoning proved to be highly unproductive. Notions of what holism means or imply vary substantially among people. The pilot interviews indicated that the 45-90 minutes available for conversation were not enough to cover all the changes outlined in Table 4-6. To enable more meaningful and productive discussions, a number of changes were prioritized taking into consideration their relevance in the mining context, as well as their potential positive implications for the effectiveness of the sustainability assessment and reporting process.



Six hypothetical additional guidance elements to the GRI G3 on “how” and “what” to evaluate and report were primarily discussed with the interviewees. Figure 6-1 below illustrates those elements<sup>34</sup>. These include three requirements to provide further guidance on how to contextualize performance and engage stakeholders, as well as standard disclosures for facility-level reporting, integrated indicators, cumulative effects, and state of impacted socio-ecological systems. Many other elements could have been hypothetically debated. Because of its complexity and breadth, the GRI framework is susceptible to various interpretations of how it can be strengthened to further meet the BelagioSTAMP. Nevertheless, the six new elements presented in Figure 6-1 are believed to address some of GRI’s key weak areas of guidance. The following sections will explain how those elements help to promote some of the needed changes.



**Figure 6-1 - An “Enhanced” GRI G3 for Mining Corporations**

Adapted from GRI (2006b, p. 3)

<sup>34</sup> Figure 6-1 was not shared with interviewees, only the “ideas” behind its proposed elements.

### 6.2.1.1 Promoting Context and Holism through Facility-level Reporting, Cumulative Effects and State of Impacted Socio-Ecological Systems Disclosures

As Sections 4.4.2, 4.4.3 and 4.4.4 have discussed, one of the most problematic aspects of GRI's reporting model is its focus on "internal organizational performance". The potential danger of this non-holistic approach is that it runs the risk of promoting disclosures that miss the interactive effects of mining corporations with the external environment. One of the ways the GRI framework tries to overcome the lack of holism is by guiding reporters to follow the *Sustainability Context* principle. This principle asks organizations to present their performance "in a manner that attempts to communicate the magnitude of its impact and contribution in appropriate geographical contexts" and "with reference to broader sustainable development conditions and goals, as reflected in recognized sectoral, local, regional, and/or global publications" (GRI, 2006b, p. 12). However, as Section 4.4.1 has highlighted, very few or perhaps no mining corporation has yet implemented the context principle in a minimally satisfactory way.

To comply with this principle, companies would need to assess their facilities' interactions with the external environment. As Bebbington (2007) explains, "it makes more sense to talk of the SD [sustainable development] profile of a country, region or ecosystem because SD tends to describe properties of a physical system in some physical space". Accordingly, it makes more sense to analyze the interactions of facilities or industrial plants with the space surrounding them. Not surprisingly, recent attempts to contextualize sustainability performance have restricted the analysis and communication of performance to project or site levels (Baxter, et al., 2004; Bebbington, 2007, 2009). A Mining Association representative (MA-4) concurred with this view. He argued that, in the case of geographically dispersed mining companies (the large ones) with dozens of operational sites, corporate level reports cannot carry meaningful contextual information. The solution, according to him, entails facility-level disclosures. Other interviewees corroborated this view while arguing that mining and smelting/refining facilities are indeed where "the rubber meets the road" (IC-3, IC-6, ME-2, ME-4, ME-3).

Facility-level reporting is just part of the solution. The need for holism and context would also require a GRI framework with more guidance on how to assess the state of the environment and societies impacted by companies' facilities. After all, such information is needed to contextualize performance facilities' performance. The framework briefly mentions this need while asking reporters to consider "recognized" publications from external sources (GRI, 2006b, p. 12). But what can be regarded as a "recognized" publication? How to deal with the potential lack of data, particularly at local and regional levels?

Moreover, as Pablo Archel and others have noted, understanding the state of the environment surrounding organizations requires the consideration of the cumulative effects of organizations' own impacts over time, as well as of the cumulative effects of the entities operating in a particular region (Archel, et al., 2008). While cumulative effects have been receiving some attention in impact assessments (e.g. Duinker & Greig, 2007; King & Pushchak, 2008), they remain largely unexplored in sustainability reporting. The GRI framework only hints at the need to consider these effects while explaining how to interpret time within the Completeness Principle (GRI, 2006b, p. 12-13).

Many other requirements, such as reporting scales (at the regional/national and global level), are arguably necessary to meet the BellagioSTAMP principles related to holism. The desirable Conceptual Framework presented in Figure 4-5 helped to illustrate this need as well. Yet given methodological and time constraints, this thesis has not attempted to discuss the barriers to incorporating these additional "layers" of assessment and reporting requirements.

#### 6.2.1.2 Promoting Understanding of Trade-offs and Synergies through Integrated Disclosures

Another previously discussed weakness of the GRI G3 is that it does not guide mining companies to understand the trade-offs and synergies among indicators and sustainability dimensions. The GRI G3 framework provides guidance and protocols on how to assess and report dozens of social, environmental, and economic indicators, but not on how to integrate them. That is, the framework does not encourage reporters to weigh and understand indicators'

relative values, or combine them into numerical indexes, indices, and visual diagrams. As discussed in Section 4.4.2, integration is important because it allows decision-makers to keep all indicators in sight, recognize their interconnectedness, identify mutually supportive benefits, and better judge the unavoidable trade-offs among sustainability dimensions (Gibson, et al., 2005, pp. 113-118).

It is a difficult task to be specific about the degree of integration that mining companies should consider in their sustainability frameworks. After all, within transnational mining corporations' operations, trade-offs occur not only among sustainability dimensions, but also among geographical locations, and spatial and temporal scales. For example, the un-sustainability of an ecosystem where a mining corporation operates in Africa may be contributing to the resilience of a particular nation in Asia that is using metal. Similarly, the overall adaptive capacity to manage environmental degradation in a mineral rich country in Africa may benefit from the declining biodiversity in one of its ecosystems caused by mining. As Alexey Voinov (2008) emphasized, in the dynamic of the biosphere, the sustainability of supra-systems borrows from the un-sustainability of subsystems, and vice versa. Given this complexity, the research protocol did not specify to the interviewees how integration would take place, if among indicators, geographical regions or scales. It simply encouraged the participants to share their general perceptions on the barriers to make it happen.

#### 6.2.1.3 Decision-making and Stakeholder Engagement

Finally, the interviewees were asked questions designed to reveal the barriers to implementing more guidance on how to engage with stakeholders and better meet the Bellagio Principle related to broad participation, taking into account not only the need to consult stakeholders to identify material issues, but also to understand context, and to integrate indicators, amongst others. A more robust guidance of stakeholder engagement processes is fundamental in sustainability reporting, because such engagements underpin GRI's principles (e.g. stakeholder inclusiveness, materiality, completeness) and have tremendous implications on the selection of, and manner through which, sustainability data are disclosed and verified.

How to identify, select, engage, and determine the extent to which stakeholders should be involved in the various decisions in reporting is still a rather challenging issue for mining companies. Even though GRI provides indicators and general guidance on stakeholder engagement – definitions, examples, tests, etc. – many reporters still need to look for guidance elsewhere. As Section 4.4.7 described, companies aware of this gap are using additional stakeholder engagements guidelines (e.g. AccountAbility, 2005b; IFC, 2007; Krick, et al., 2005; Partridge, et al., 2005), under a diversity of rationales that undermine the comparability and quality of the reporting process.

### *6.2.2 Analytical Approach to Triangulate Interviews with Secondary Data*

The barriers involved in the implementation of the changes above include various factors (e.g. conceptual, institutional, behavioural, political, and procedural), which can be valued and interpreted in different ways. In light of this complexity, this thesis did not aim at reaching an overall explanation, but at capturing the situated perceptions of barriers from various people involved in sustainability reporting. To capture this knowledge this chapter followed most of Charmaz's (2006) suggested procedures: coding, memo-writing, and diagramming.

Several barriers were inferred by analyzing the literature. But, given the lack of studies with a specific focus on “barriers to changing sustainability reporting frameworks”, additional data had to be generated through interviews. All 41 participants, as Appendix 2 shows, were asked about the potential barriers to implementing some of the “ideas” raised in the previous sections. The analysis of their opinions was driven by the identification of relevant insights and qualitative patterns, rather than by the quantification of data. The samples of interviewees were not probabilistic and the interviews did not follow a rigid, structured questioning process. Any attempt to quantify information within and across the groups of interviewees could result in misleading conclusions.

Moreover, the eight different groups consulted during the research have different degrees of knowledge of GRI reporting and sustainability framework design (Table 6-1). These differences of knowledge were carefully considered in the interpretations of the data. For example, the interviewed NGO representatives, although aware of the use of the GRI framework among mining corporations, had superficial knowledge of the GRI G3 elements. As one of them explained: “I am familiar in a sense of having heard of and looked at the GRI (...) but I never read a paper on it” (MN-1). Therefore, their opinions were weighted very differently from those of Mining Companies, Associations, and GRI-certified Consultancies, who deeply understand the challenges involved in the application of GRI’s principles, indicators, ABC level, among other elements. The criteria for selecting the interviewees have been previously described in Section 2.3.2.2.

**Table 6-1 - Knowledge of GRI Reporting and Sustainability Framework Design among Interviewee Groups**

Interviewee Group	Code	Quantity	Knowledge of			
			Structure of the GRI G3	Application of the GRI G3	Application of the GRI G3 in Mining	Sustainability Framework Design
GRI-certified consultancies	CC	5	High	High	Medium	Low
International Consultancy Research Centres and Departments	CI	6	High	High	Medium	Medium
Mining Industry Practitioners	RD	5	Medium	Medium	Low	High
Mining NGO Representatives	MP	6	High	High	High	Low
Mining Sustainability Experts	MN	4	Low	Low	Low	Low
Mining Association Managers	ME	9	Low	Low	Low	Medium
Reporting Organizations	MA	4	Medium	Medium	High	High
	RO	2	High	High	Medium	Medium

The data analysis was largely supported by the previously described QSR-NVivo 8. The analysis included the identification and coding of the main themes in the literature and

interviewees' perceived barriers. The codes were grouped according to their potential relationships in several tree nodes, allowing for the identification of common and contrasting properties among them. This iterative process helped to design a tentative diagram of the barriers "grounded" in the data.

### **6.3 The Categorized Barriers to a Stronger Framework**

Participants' opinions have complemented the literature with various factors that could hinder the implementation of the framework elements highlighted in Figure 6-1. Dozens of barriers were identified. The initial analyses indicated many possibilities as to how to group, organize and categorize those barriers, as they shared a number of similarities and apparent relationships. Among the rationales considered for the organization and discussion of the findings were barriers with respect to

- their nature (managerial, technological, organizational, political);
- their level of relevance;
- the interviewee groups that raised them;
- the proposed change in Figure 6-1; and
- the institutions capable of overcoming them.

There is no theory or manual that discusses how most effectively to analyze barriers to change. A number of previous studies addressing barriers to institutional, managerial and technological changes were reviewed during the research (e.g. Hart, et al., 2009; Holling, 1995; Klassen & Whybark, 1994; Plummer & Armitage, 2007). The reviewed approaches were diverse as they mirrored particular research objectives and contexts.

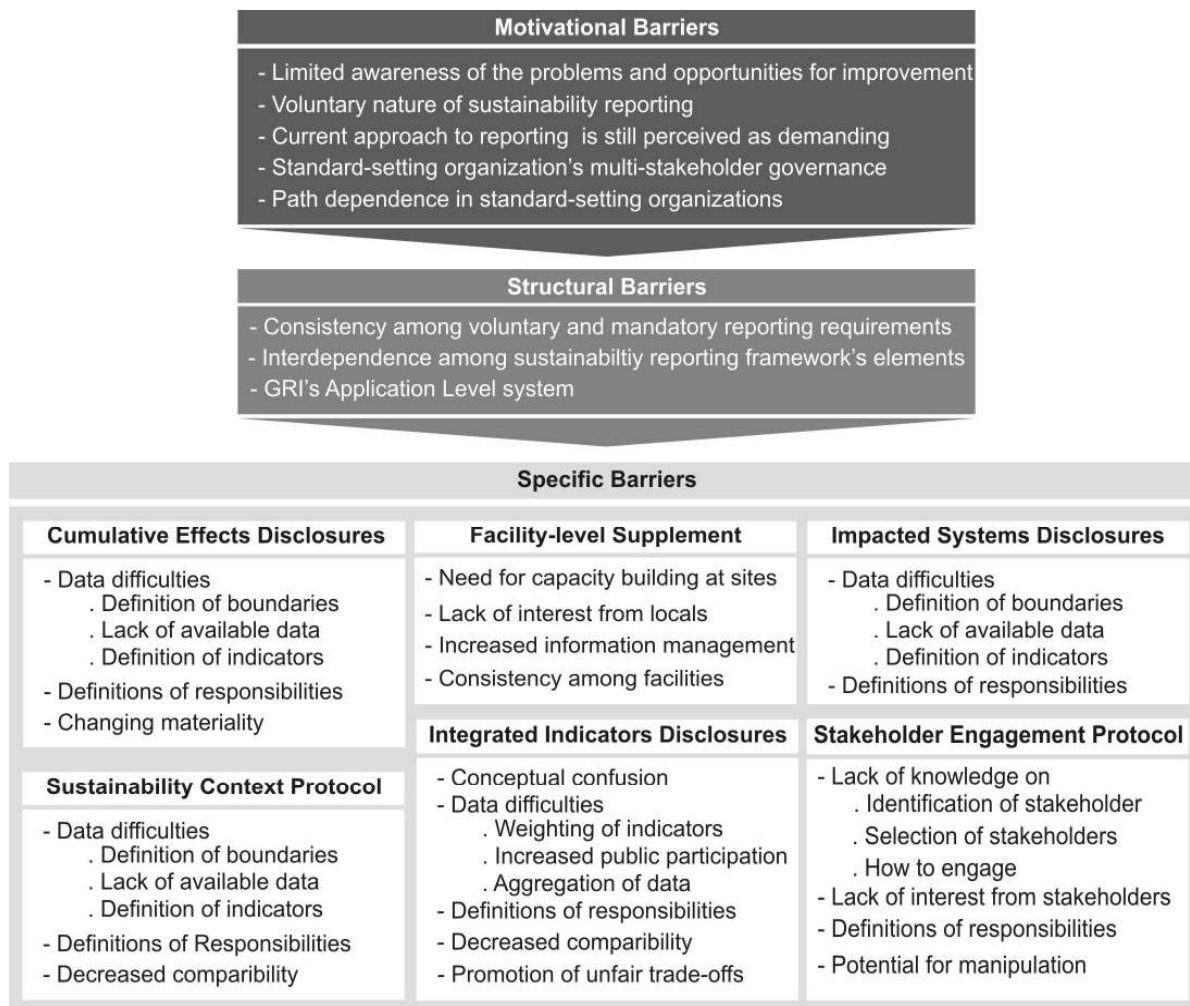
Given the rather exploratory nature of this study, the main concern in the analysis was to identify the main "areas" of challenges, rather than very specific issues in connection with each of the proposed changes in the framework. Accordingly, many of the interviewees' opinions were grouped together into broader issues.

That said, the iterative analyses of the relationships and common broad themes underpinning those barriers have revealed a pragmatic sense in arranging them in three main groups: motivational, structural, and specific.

Motivational refers to those factors that affect organizations' motivation to enhance reporting frameworks, be it standard-setters, industry associations, or mining companies. Structural barriers refer to the challenges that are likely to emerge, regardless of the changes to be implemented in the framework, in the enhancement process. Such factors stem from the many interrelationships within and across reporting frameworks. Finally, specific barriers are those more directly associated with the specific changes proposed in the GRI framework, as each proposed change has particular barriers to its implementation. The tentative diagram in Figure 6-2 below illustrates these categories and their respective barriers, which will be further discussed below.

The diagram intends to illustrate the fact that, for the purpose of overcoming the challenges associated with each of the changes proposed in Figure 6-1, previous layers of barriers may need to be considered as well. One of the limitations of previous studies on barriers to change was that they seemed too simplistic while trying to identify a simple "set" or category of issues. The analysis in this thesis revealed, instead, a more nuanced constellation of factors with potential interrelationships.





**Figure 6-2 - Tentative Diagram of the Barriers to Strengthening the GRI G3**

### 6.3.1 Motivational Barriers

Many participants suggested that additional “layers” of guidance and requirements could be hindered by a current lack of “motivation” or “willingness” from both mining companies and the institutions involved in the design and promotion of the GRI framework. Some concerns were explicit (RD-2, MN-3, MN-4, MA-1, MA-4), but most were implicit in participant’s perceptions. They raised a number of factors (Sections 6.3.1.1 to 6.3.1.5) that indicate that the discussed changes should not be currently made a priority for mining companies, associations,

standard-setters. The only exception was the development of facility-level reporting, which does seem to be entering the agenda of some large mining companies.

This *a priori* motivational barrier is corroborated by GRI's current agenda of priorities, which includes a number of issues to be researched and further implemented in the future, but none directly related to the six additional elements outlined above (GRI, 2010b). There seems to exist a mismatch between GRI's research priorities and the issues raised in Chapter Four as needed to be implemented for better reporting. A number of factors explain this situation.

#### 6.3.1.1 Limited Awareness of Problems and Opportunities for Improvement

The strategy used in the interviews involved an initial inquiry about participant's perception of the strengths and weaknesses of the GRI framework as a tool to promote sustainability disclosures. The purpose of this initial question was to understand if participants shared the views of a growing scholarship that is calling for an enhanced framework for sustainability reporting. Only after these initial questions, interviewees were informed about the arguably needed elements in Figure 6-1.

Surprisingly, twelve people interviewed who are directly involved in GRI training, reporting, and even in the design of the GRI framework, stated that the GRI framework was already strong enough to guide companies to publish reports that present meaningful information about "contributions to sustainability" (IC-1, IC-3, IC-4, CC-1, CC-2, CC-3, CC-5, RO-1, MP-2, MP-4, MP-5). Most of these interviewees emphasized that the problems of current reports are not a result of the GRI framework, but of misuse or misinterpretations. Such views reflect the ICMM initiative discussed in Chapter Five, whose focus is on ensuring GRI-compliant documents.

The statement of one international consultant that often provides services in connection with the framework is very illustrative. When asked whether the GRI can effectively promote disclosures of contributions to sustainability, he answered:

*Yes, but it all depends on how the reporting organization interprets the framework, and how seriously they embrace an ethic of transparency and accountability, and true responsibility for transformation to sustainability over and above the minimal requirements of GRI. (IC-1)*

Two people who were directly involved in the multi-stakeholder working group responsible for the design of the GRI MMSS, were not aware that GRI reports were not observing the Sustainability Context principle. One of them stated: “I would think that GRI needs to do a better job in communications with reporting organizations, because I haven't heard that critique from them at all. And I was actually involved with GRI's sector supplement review, the MMSS, and that was not on the table at all” (MP-3).

Similarly, NGOs are not significantly concerned about GRI's limitations. All NGO representatives emphasized the benefits of GRI reporting and the need to promote it in the sector. They seemed more concerned with its misuse (MN-3) or with the lack of application of the GRI among small and medium-size mining companies (MN-1, MN-2, MN-4) than with problems in the structure of the framework. In this context, activism for better frameworks seems unlikely to emerge soon.

This lack of awareness of GRI's limitations is arguably reflected in the literature. The critical studies on the problems of the GRI model of reporting, which triggered and underpinned this thesis, are but a very small part of the body of literature on sustainability reporting. Most scholars have been describing and criticising trends and practices (or lack of practices), rather than proposing ways to take the reporting models to a higher level.

A possible explanation for this limited awareness of the opportunities to make GRI reporting a better tool to communicate contributions to sustainability could be the existence of confusion about the implications of the sustainability concept to corporate reporting. For example, the interviewed consultants, while somewhat familiar with the debates on CSR versus CS, did not seem very concerned about this terminological conflict. One of them said that his clients are always questioning him about which concept they should use in their programs and strategies.

His usual response is that companies should “use the term, the terminology that better fits the culture of the organization and that makes sense to their stakeholders” (IC-6). Similarly, a manager working in a standard-setting organization believes that the CSR versus CS debate is irrelevant, as the topics or issues in CSR and CS reporting will remain the same (RO-1). Terminological rigor, however, was clear among the five researchers interviewed during the research. They all presented contrasting views to the consultants, while arguing that sustainability demands a different approach to assess and report issues.

### 6.3.1.2 Voluntary Nature of Sustainability Reporting

The predominant voluntary nature of sustainability reporting was highlighted by some interviewees as a constraint to implementing demanding reporting requirements (IC-4, CC-4, MN-3, RD-2, and MP-5). For instance, a reporting practitioner, when asked about the benefits of adding integrated measures to the framework, saw many difficulties in doing that and claimed that “voluntarily” many companies would not do that (MP-5). Such views appear to be in line with what the literature indicates.

Sustainability reporting has been primarily driven by pressures other than mandatory regulations. Some countries, like Sweden, France, and Denmark, have introduced some sort of mandatory sustainability reporting (UNEP and KPMG, 2006), but these are the exception. In a voluntary or non-mandatory environment, sustainability reporting needs to make business sense. Companies engage in this practice to, for example, attract investors, respond to NGOs, facilitate “licence to operate”, and pursue competitive advantage (Buhr, 2007). In doing so, they have motivations and opportunities to “cherry-pick” and disclose incomplete accounts of their negative impacts. The incomplete external verifications of mining company reports scrutinized in Chapter Five illustrate this problem; and so do reporting organizations’ and assurers’ disregard for the Sustainability Context principle.

Mandatory reporting has a number of potential advantages, including promoting more frequent, complete, and relevant disclosures (UNEP and KPMG, 2006, p. 14-15). The GRI institution,

aware of these benefits, has been lobbying for mandatory reporting. In reaction to the recent economic crisis, GRI's board issued the *Amsterdam Declaration on Transparency and Reporting*, calling on "all governments to extend and strengthen the global regime of sustainability reporting. In particular, assumptions about the adequacy of voluntary reporting must be re-examined" (GRI, 2009e). One corporate sustainability researcher suggests that mandatory reporting is not "a question of whether. It is a question of the speed and the nature, the avenues, by which it will happen" (RD-1).

Nonetheless, Canada is currently providing signs that these avenues are likely to be contested and long ones. This country has very relevant mining activities abroad that have long been triggering studies concerning the need for better social and environmental accountability of international mining operations (McAllister, et al., 1999). In reaction to one of the most thorough reports that addressed this problem (Andrews, et al., 2007), a member of parliament proposed Bill C-300, which, amongst others, seeks to empower the Canadian government to investigate mining companies' disclosed sustainability performance, and to impose sanctions on those non-compliant with CSR standards (BILL C-300, 2009). Bill-300, while praised by NGOs and some scholars (Janda, 2009; MiningWatch Canada, 2009), is receiving an enormous push back from the industry (Barrick, et al., 2009; Foster, 2010).

#### 6.3.1.3 Current Approach to Sustainability Reporting is Still Perceived as Demanding

Sustainability reporting, regardless of governments' willingness to step in and regulate the practice, will continue to evolve. Better unregulated means to report need to be developed and the institutions trying to shape this future need to be mindful of the existing challenges. Setting the bar too high might inhibit the voluntary uptake of the framework.

In principle, reporting should be the outcome of sustainability evaluations. Studies, however, are showing that the evaluations are usually an outcome of reporting (Buhr, 2007). Several interviewees have noted that one of the framework's key strengths is to help organizations "initiate" a culture or policy of sustainability (CC-2, IC-3, RD-5, MP-2). As one of the

consultants said, “the GRI provides a standard to start a platform of dialogue towards sustainability” (CC-2). Many reporting organizations are still setting up programs and information systems to meet the framework’s requirements. This fact is corroborated by GRI’s recent statistics shown earlier in Figure 3-11. Only 22% of the GRI-based reports published by mining companies in 2008 declared an A+ level, which is supposed to indicate a higher level of maturity in reporting.

Moreover, in spite of GRI’s growing relevance in the mining sector, the reality is that it is probably adopted by no more than 70 mining companies (GRI, 2010a), which represent a small fraction of the world’s mining companies. As Markus Palenberg and others explain, “NFR [non-financial reporting] remains a niche practice, utilized primarily by large TNCs [transnational corporations] based in the OECD world. However, in terms of absolute numbers, NFR is uncommon even among TNCs” (Palenberg, et al., 2006).

In this context, adding more requirements on “what” and “how” to report is delicate. Even the large OECD-based companies perceive the (incomplete) adoption of the G3 framework as demanding. Two mining association managers approached during the research, although concurring on the need to push reporting to a stronger level, revealed significant concerns about the timing of these changes (MA-3 and MA-4). They are afraid that setting the bar higher right now would inhibit the uptake of reporting.

#### 6.3.1.4 Standard Setting Organizations’ Multi-stakeholder Governance

Another barrier that can affect motivation to strengthen the framework, ironically, is related to one of GRI’s most praised aspects: the broad multi-stakeholder governance system. This system, seen as GRI’s “key signature” (H. S. Brown, Jong, & Lessidrenska, 2009) and regarded as “an amazing way to go about it” (CC-5), hosts an imbalanced representation of types of constituencies, particularly in its Organizational Stakeholder group. This democratic group is GRI’s key source of legitimacy, as its organizations can vote for members of the Stakeholder Council and approve nominations for the Board of Directors (GRI, 2009d). The

most robust study on the institutionalization of the GRI to date has found that

*since the initial years, participation of organized labour and NGOs has declined, partly owing to resource constraints (for NGOs) and partly because of limited interest. Currently, large companies, banks, accountancies, and certain think-tanks that double up as consultancies for business, dominate the Organizational Stakeholders group.*  
(Brown, Jong, & Levy, 2009, p. 573)

This study concluded that GRI's "emerging institutional logic reflects only some of its intended constituencies, namely multinational companies and financial institutions, and international business management consultancies and accountancies" (H. S. Brown, Jong, & Levy, 2009). This imbalance of constituencies is currently mirrored in the Stakeholder Council (GRI, 2009e) and may also affect the design of the reporting framework. Demanding reporting requirements that do not necessarily meet the interests of the strongest constituencies (such as business organizations) are less likely to be approved. This situation can affect not only the design of the GRI G3 main guidelines, but also of additional supplements like the MMSS, as these additional documents are coordinated by GRI.

One of the consultants whose firm participates in the GRI Organizational Stakeholder group revealed another problem associated with the multi-stakeholder governance: the challenge of building consensus. As he puts it, "it really takes a lot of time to make decisions, to get feedback, and sometimes you feel like they should put down the rules or the fist on the table and give harder guidelines, and always seek commentaries". (IC-3) Trying to reach consensus over the approval of complicated or demanding reporting requirements among different social groups is, obviously, a challenging process. To Mallen Baker, this is actually an impossible task, as "some of those audiences have such diametrically opposed starting points". (Baker, 2006, no pages)

#### 6.3.1.5 Path-dependence in Standard-setting Organizations

On numerous occasions, interviewees argued that some of the additional elements of Figure

6-1, although relevant, should not be incorporated into the GRI framework, but implemented voluntarily by its users (e.g. RD-5, MA-1, MA-2, RO-1, MP-1, MP-2). According to one of the interviewees, GRI should remain “focused on the core mission, which is organizational-level disclosure, and resisting to the temptation and the pressure to do many other things” (RD-5). Such a view reinforces Brown and other’s study which found traces of path-dependence limiting GRI’s efforts. As they put it, “GRI has thus arrived at its maturation stage facing a plethora of challenges, many of which are grounded in the strategies adopted by its founders” (Brown, Jong, & Lessidrenska, 2009, p. 197).

Since its inception, GRI has remained faithful to providing guidance on organizational-level, non-integrated disclosures. Practice and research, however, are showing that this focus has led to an incomplete framework. Recent years have been witnessing the emergence of guidelines whose purpose is to complement GRI’s. Notable examples are the AccountAbility series and CERES’ recent Facility-Level Reporting Project (CERES, 2005), which address the need for more guidance on stakeholder engagement and facility-level disclosures.

This phenomenon seems to indicate a future where the GRI G3 will become one among various mutually reinforcing reporting guidelines. Numerous opportunities are likely to emerge for mining associations (not only international ones, like ICMM, but national and commodity-oriented ones) that are interested in the promotion of more robust sustainability reporting processes.

### *6.3.2 Structural Barriers*

Motivation is just part of any strategy to establish a stronger framework. There are many barriers to enhancing reporting requirements regardless of who is motivated to develop and implement them. Some of these barriers do not depend on the nature of the changes to be implemented in the framework: they stem mostly from the relationships that the GRI G3 has with other reporting tools or from the interdependence among reporting elements.



### 6.3.2.1 Consistency among Voluntary and Mandatory Reporting Requirements

The GRI framework is not being adopted within a vacuum, but within numerous mandatory and voluntary social and environmental tools that require some degree of reporting. Mining corporations, depending on the countries where they operate, may concurrently use six or more different non-financial reporting frameworks covering the performance of exploration, and projects. Each of these frameworks has particular metrics and approaches.

A number of interviewees have raised the need to promote synergies among these frameworks (IC-6, MA-2, MA-3, MP-1, MP-2, MP-4, MP-5, and RD-4). Nonetheless, they have diverged on how to address this problem. For example, one researcher stated that the more regionally focused reporting frameworks should carry a sub-set of GRI's indicators (RD-4), whereas a mining practitioner believes that the GRI framework should be replicated at different levels (MP-1).

To promote more compatible reporting guidance, GRI has been increasingly partnering with other voluntary corporate responsibility initiatives, such as IFC's and Global Compact's (IFC and GRI, 2009; United Nations and GRI, 2006). But these efforts are just scratching the surface of the variety of reporting requirements faced by companies. For instance, the synergies and conflicts between voluntary and mandatory reporting requirements remain largely unexplored.

Some interviewees noted that there is already a regulated tool that asks for some disclosure of contextual performance, impacted systems, and cumulative effects at the facility level: the Environmental Impact Assessment (e.g. IC-6, RD-2, RD-3, MP-1). These assessments, in many jurisdictions, require from proposed mining projects an understanding of their potential interactions with affected systems. Nonetheless, as one of the interviewees highlighted, the problem with EIAs is that their follow-ups in general are not sufficiently consistent and robust to feed a reporting system in the same fashion of corporate sustainability reporting (MP-4). This situation indicates an interesting opportunity for public-private cooperation in the

development of new reporting systems at the site and regional levels. Governments, however, have been largely absent from the discussions of sustainability reporting.

#### 6.3.2.2 Interdependence among Sustainability Reporting Elements

While strengthening the framework, the recognition of the relationships of the GRI framework with other reporting initiatives must be accompanied by the recognition of interdependence among GRI's guiding elements. A reductionist approach ought to be avoided, as the framework's principles, indicators, protocols, and supplements can affect each other. In this context, the challenge is not just a matter of setting the bar too high or too low, but of how to structure and weigh the framework's elements.

For instance, the creation of a principle such as *Sustainability Context* calls for geographically-based reporting, which has not been promoted by GRI. Similarly, an increase in the number of indicators can broaden the scope of assurers and demand more technical protocols. One of the interviewees participating in the development of GRI's Mining and Metals Sector Supplement (MMSS) witnessed such a tension. She claimed that the NGOs were pressuring for more indicators without realizing their negative effects in the reporting process (MP-2).

The potential implications of changes in particular framework elements can also be positive. For instance, an adjustment of a sector supplement can help to fill the gaps of the main GRI guidelines. Yet such potential positive effects are not always fully perceived by those involved in the design of the framework. The development of the MMSS provides a good illustration. Despite the relevance of facility-level reporting in the mining sector, which was corroborated by all interviewed mining practitioners, this supplement is not being designed to encourage this level of reporting, but simply to add more sector "issues" to be disclosed at the organizational level (GRI, 2010d).

### 6.3.2.3 GRI's Application Level System

GRI's ABC Application Level system (described in Section 3.4.3) is perhaps the best example of how reductionism in the design of the framework can lead to unintended negative consequences. The underlying purpose of that system is to distinguish between beginning and advanced reports. The system grants a "plus" sign to reports that were externally verified, a "C" to reports with a minimum of 10 core indicators, and "A" to reports covering all core and material indicators by reporting on the indicator or explaining the reason for its omission (GRI, 2006a).

This system, however, can be misleading, because it does not require organizations to observe other principles and reporting requirements. Accordingly, "advanced" or A+ compliant reporting organizations can overlook relevant reporting principles. This fact was corroborated by a recent empirical study on the quality of reporting in the cement industry which found that the reports "do not contain all relevant information for judging corporate sustainability even though they are rated A according to the Application Levels of GRI" (Isaksson & Steimle, 2009, p. 180).

Mehrdad Nazari, a reporting consultant and GRI-certified trainer, has also argued that this system "appears to be creating psychological and legal barriers to sustainability reporting" (Nazari, 2009, p. 128). Managers, aware that the Application Level can be erroneously interpreted as a measure of quality, fear to publish a C-level report. Some managers, particularly in the US, even decide to bypass the whole ABC system fearing litigations that may stem from disagreements over their materiality criteria (Nazari, 2009).

Another significant side-effect of the Application Level is to discourage reporting beyond its requirements. After all, organizations can achieve A+ by simply observing the principle of materiality, hiring external assurance (of any sort or quality), and disclosing or justifying lack of disclosures on every core indicator. As one of the interviewees put it, "this quest by companies to get an Application Level to the GRI is probably in a way contributing to that

avoidance of context. Because companies want to report on all indicators, and get the A+ certification, they perhaps miss the bigger picture” (IC-3).

### 6.3.3 *Specific Barriers*

Some barriers were found to be more specific, in the sense that they were more related to the nature of the enhancements to be implemented in the framework. The analyses revealed literally dozens of such barriers. Many of them hold similar properties and apply to more than one of the elements discussed in section three.

#### 6.3.3.1 Barriers to a Sustainability Context Protocol and Standard Disclosures on Cumulative Effects and State of Impacted Systems

The application of the Sustainability Context principle depends on an understanding of the state of impacted socio-ecological systems, which depend, in turn, on the evaluation of cumulative effects. The discussions about these three elements revealed several similar barriers. Among interviewees’ most cited ones were difficulties in the acquisition of data and defining who will generate them. Contextual information is inconsistently situated outside the boundaries of reporters. This poses questions such as:

- How to define the boundaries of impacted systems? (IC-2, MP-3)
- Who should generate and pay for these data? (CC-2, RD-2, MN-3)
- What indicators, unit and frequency of analysis should be used? (RD-3, MP-3, MP-4)

If each organization were to produce contextual information, there would be overlapping efforts and costs in geographical regions. In light of this “common” burden, many interviewees, including a representative of NGOs, argued that the external data should not fall under individual organizations’ responsibility. Among the actors raised by interviewees as better situated to participate in the generation of that information were governments (IC-2, IC-3, RD-4, MP-5), industry associations (IC-2, RD-3), NGOs (MA-2, IC-2, MP-5), and

communities (RD-2). One of the researchers argued that, in light of these difficulties, this type of reporting is unlikely to emerge soon:

*The cumulative impacts stuff does need changes in the patterns of reporting. In certain cases it is actually logical for companies in an area to collaborate in some way. Because, to take your point, if you are understanding the context, be it a local ecosystem or something else with multiple operations, it is very, very difficult for any individual mine, even if it tried to, to report on its contributions to that. If you combine the whole lot you would get the critical sense. That's the next stage. If you are looking 10 years down the track, we will start to see those kinds of reports. (RD-3)*

Another interesting factor highlighted as a potential barrier to the evaluation of cumulative effects was the dynamic nature of socio-ecological systems (MP-3, RD-3). The GRI framework requires organization to report material issues. But, because material issues are always changing, some disclosures may not be carried over to the future, thus adversely affecting the evaluations of cumulative effects. The analysis has also revealed a conceptual barrier. A couple of interviewees, despite their familiarity with the GRI framework, were clearly mixing context with materiality (MP-3, CC-4). Such confusion is understandable, because contextual information is often used to identify material issues. However, as one of the researchers noted, context manifests in forms other than “materiality” (RD-4).

In light of the many challenges and actors involved in the contextualization of performance, two interviewees questioned standard setter’s ability to create a technical protocol on this process (IC-3, RD-4). Their argument was that reporting organizations should be encouraged to find their own ways to do it. The real challenge is then to how motivate organizations to follow the Sustainability Context principle and what it entails. After all, the status quo suggests that companies are not trying to do so (McElroy, 2008; McElroy, et al., 2008).

### 6.3.3.2 Barriers to a Facility-level Supplement

Three mining practitioners noted that the barriers to facility-level reporting are far less intimidating than those involved in the contextualization of performance (MP-3, MP-4, and MP-5). The best evidence of this fact is that some large companies, as

Table 3-2 highlighted earlier in the thesis, are already doing it. In Canada there is even a multi-stakeholder initiative – Initiative for Responsible Mining Assurance – trying to create a standard for this practice without, however, the involvement of GRI audiences (IRMA, 2009). The evaluation of sustainability performance at facilities is a necessary step towards the publication of the organizational-level document. Moreover, as an international consultant noted, facility reporting is

*(...) actually what matters to most "social licenses to operate", because it is the community level that is most impacted. For all of those reasons, I would strongly argue in favour of moving towards facility-reporting but not to abandon corporate reporting. I think the corporate report needs to change, I don't think it should try to cover everything like GRI, I think it tries to do too much. (IC-6)*

The analyses of mining companies' reporting practices indicate that some companies, for the purpose being more transparent or meeting the information needs of local stakeholders, decide to disclose facility performance. Nonetheless, few of these local disclosures are following the GRI framework. Facility-level reports usually come in the form of “annexes” in the organizational GRI-based report and carrying highlights and numerical data.

A barrier that may contribute to this “incomplete” approach is the unclear cost-benefit of robust local disclosures. As mentioned earlier, organizational-level reporting may already be perceived as a burden for large companies. So, extending it to the local level needs to make some business sense. As one interviewee said, “Of course it would be great to have a GRI [report] at each site, but you have to be strategic as to where you are going to focus your capacity, your efforts. So it might not be through GRI reporting, but through community meetings, through one-on-one meetings, or non-traditional types of reports at all” (MP-3). One of the consultants corroborated this view while arguing that companies need to define a threshold or “size beyond which facility level reporting becomes mandatory” (IC-5), in order to avoid a very large volume of disclosed information.

Another hurdle in facility-level reporting is that it increases the exposure of companies to the public, and thus the need for more information management. A significant part of the current GRI reporters are publicly listed companies whose financial health depends on the interpretation of their disclosures. They need to be careful when publishing sustainability information because it can affect their reputation and market value. One consultant shared an interesting case in which a Spanish-headquartered company prohibited one of its facilities in South America from continuing with its sustainability reporting, because it was damaging the company's image (CC-3). As opposed to building capacity in South America, the Spanish headquarters decided to interrupt its facility's disclosures.

#### 6.3.3.3 Barriers to Integrated Sustainability Performance Indicators

The topic of integrated performance was difficult to discuss with interviewees. In the current practice of reporting, the term "integration" is increasingly being used to designate disclosures of sustainability performance along with corporate financial and strategic information (Eccles & Krzus, 2010). That is, the concept of integration is also being used to describe the "integrated management and reporting approach as making reporting part of an overall management scheme [to] improve corporate performance" (WBCSD, 2003, p. 4). Few of the interviewees were familiar with GRI-G2's previous call for integrated indicators.

One researcher claimed that integrated sustainability performance is what several financial analysts are already doing to evaluate risks and opportunities within publicly listed companies (RD-1). He cited several of these initiatives, such as the Dow Jones Sustainability Index, Transparency Index, FTSE KLD, and Asset 4. Another researcher questioned, however, this interpretation of "integration" by arguing that what these initiatives are doing is just "aggregation":

*Aggregation you add pieces up. Do you think because you have some social, ecological and economic reporting, and you call it the triple bottom line, and you add those things up, you get integration? That's not integration! That's three different things added*

*together as if they were equivalent. Maybe they are in some weird way. But it doesn't tell you how they interact. (...) I am talking about interrelationships, the dynamics interrelationships about links that are important in integration. It is much more complex. (RD-2)*

The disputed and confusing discussions on integrated sustainability performance suggest that, for the purpose of advancing this requirement, a conceptual barrier needs to be overcome first. Integration currently means different things to those involved in sustainability evaluations and reporting. Only after the “adopted” meaning of integration in this study was explained to interviewees, did it become possible to capture their perceptions of the challenges involved in implementing it.

Many interviewees noted that integrated indicators would probably encounter the same barriers associated with the contextualization of sustainability information, because the latter is necessary to build the former. Furthermore, they raised four main concerns about the process of weighing and aggregating social, environmental, and economic data towards integrated indicators (CC-1-IC-2, IC-3, IC-5, RD-1-4, MP-1-5). Among the most relevant ones are:

- Who should decide and participate in this process? (IC-3, RD-2)
- How to deal with conflicting views on the potential weights of indicators? (RD-4)
- How to aggregate indicators across different geographical facilities? (MP-1, MP-3)
- How to aggregate qualitative data in connection with social performance? (MP-2)

These questions make evident that integrating sustainability performance is teemed with subjectivity and practical challenges in the processes of weighting and aggregating data. One of the interviewees feared that, if integration were made a requirement by GRI, organizations would have the opportunity to manipulate data and also to promote the “weak” version of sustainability<sup>35</sup> (RD-5). To avoid this danger, integration would need to be accompanied by the definition of clear thresholds in connection with sensitive indicators, as well as with

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<sup>35</sup> As Sections 3.5.3 and 4.2.6 explain, weak sustainability is a concept used in Ecological Economics to refer to a situation in which substitutions of natural and man-made capitals are allowed, as long as the total capital of the system is sustained (Gutés, 1996; Pearce & Atkinson, 1993). The weak approach is seen by many environmentalists as a dangerous path, because it may overlook the limits to substitution imposed by ecosystems' carrying capacity.



transparent mechanisms to deal with the tradeoffs among them (RD-2). However, there is limited knowledge of how to address such thresholds and tradeoffs among corporate sustainability indicators.

Interviewees diverged on how to address these many challenges. Some suggested that GRI or any other standard setter should not try to standardize this process, but simply encourage reporting organizations or other actors to do it (RD-1, IC-3). Others claimed that integration should be avoided entirely, because it would be too time consuming and not necessarily lead to reliable results (IC-1, IC-6, MP-5).

#### 6.3.3.4 Barriers to a Protocol on Stakeholder Engagement

The main barrier to the implementation of additional guidance on stakeholder engagement into GRI is, as mentioned in Section 6.3.1.5, motivational. GRI is not inclined to elaborate on those elements because they are believed to fall outside the institution's core mission. Assuming, however, that GRI or another partnering institution is motivated to develop further guidance on these requirements, a number of additional barriers need to be addressed.

The practice of stakeholder engagement has many knowledge gaps. For example, there have not yet been developed consensual methods to identify, select, and engage stakeholders in the reporting process (Friedman & Miles, 2006; O'Dwyer & Owen, 2007; Perrini & Tencati, 2006; Unerman, 2007). Some interviewees, particularly the mining practitioners (MP-2, MP-3), commented that the current guidelines produced by other institutions to complement the GRI framework on these topics are not sufficient.

Stakeholder engagements are an essential part of reporting, because “sustainability performance is a function of what a company impacts on vital resources relative to the need for those resources by people who rely on them.” (RD-5) Stakeholders provide companies the information they need to determine “what” should be reported. Yet, as mentioned above, there are several doubts as to how to undertake this process:

- Which stakeholder groups should be considered? (RD-5)
- How to identify representatives of stakeholder groups? (MP-1)
- How to empower stakeholders so that they feel motivated to participate? (CC-4, RD-4)
- Who should mediate and analyze the engagements? (IC-2)
- How to deal with conflicting perceptions of materiality over the same issue? (MP-1, MP-3)

Because the answers to these questions are still unclear, reporting organizations have had substantial room to come up with their “particular” approaches. To one of the consultants, this is a problematic situation that can lead to manipulation of the process. As he said,

*I've been around the block long enough to know that it is also incredibly easy, in fact far easier, to manipulate a stakeholder process than it is to manipulate a verification process. So you can certainly stack the deck in terms of who you get into the room, far easier than you could stack the deck with regards to the physical measures of the emissions coming out of a particular pipe. (...) Companies can hack that [engagement] system too easily by creating their own NGOs groups for example. That happens, as we all know. NGOs get created and financed by industry sectors behind two or three levels of anonymity. So it takes a long time for people to figure out that the new group is financed by the companies, and that they are critiquing in a soft way to draw attention from the hard stuff. Things can get very subtle and sophisticated. (IC-1)*

## **6.4 Overcoming the Barriers: Strategizing Change**

This chapter did not try to cover all challenges. For example, the need for understanding barriers with respect to scales and forward-looking assessments were not considered. This is a relevant limitation of this thesis, as the mining’s future legacies are one of the most relevant issues for sustainability decision-making in the sector. However, the discussions above already show that many barriers cannot be overcome in the short-term, as they depend on the generation of new knowledge and partnerships between various parties to design the needed indicator systems. Most importantly, this chapter revealed that motivation, or lack thereof, is the primary barrier to more meaningful sustainability reports. With the exception of facility-level reporting, standard setters, industry associations, NGOs, and mining companies do not

seem to be currently interested in promoting the discussed elements in the near future. But, even if they were, the challenges would be notable.

Unlike the ISO standards that address more specific and bounded social and environmental management systems or issues, the GRI framework has a much more all-encompassing scope. The discussed barriers suggest that a single institution or standard-setter may not be sufficiently equipped to standardize the necessary changes. The promotion of contextual disclosures, cumulative effects, integrated indicators, and more effective stakeholder engagements are likely to depend on the work of organizations that are not actively participating in the sustainability reporting debate. Governments, communities, industry associations, several players need to participate in this process of change.

The new guidelines created to fill GRI's gaps are starting to indicate a future where the GRI framework will become the centrepiece of a tapestry of mutually reinforcing reporting guidelines. A number of future studies will be needed to help establish effective linkages among these initiatives.

This chapter has highlighted specific thematic areas that need further work. These include, among others, mechanisms to share responsibility over the generation of contextual data, methods to integrate sustainability performance, and processes for mediating stakeholder engagements. The production of knowledge on these issues will be essential to the design of more effective frameworks in the future.

Interestingly, the barriers described above indicate that if GRI were to promote effective contextual and integrated sustainability performance, this would inevitably lead to the publication of less comparable reports, which go against GRI's current focus on the promotion of standardized organizational-based disclosures. This indicates that further development in the field of reporting will entail conflicts with the current roles and expectations of standard setters.

Nonetheless, there are a number of practical actions that GRI, mining companies, and associations can already take to strengthen reporting. The most obvious is to confirm and recognize the value of the discussed changes, so that they can set up a strategy to move towards the “ideal” framework. Several approaches, ranging from incremental to transformational, can inform such a strategy (Dunphy, Griffiths, & Suzanne, 2007). It will be up to each organization to assess how equipped it is to address the many barriers.

Of course, the process of deciding about the “best” strategy is not an easy one. The representative of a mining association, although realizing the potential benefits of some of the new elements in Figure 6-1, raised the point that the “ideal is not always the ideal”. The needed changes depend on the current willingness and capacity of the reporting organizations to do so:

*What we need to do is to take the next step that's gonna make the biggest difference according to what people are doing now. If the mining industry has to put in place an approach to deal a range of issues that generally they are not comfortable with, or have not been comfortable with (because that's new stuff for them,) and if we can do that through introducing a kind of management system that provides this kind of reporting [ideal one], than that is absolutely the ideal thing to do right now. (MA-1)*

The previous sections have provided nuanced information that can be helpful in strategizing this process. For example, they shed light on how strong the many barriers to strengthening the framework can be. While the standardization of contextual and integrated sustainability performance may not be feasible in the near future, a revision of GRI’s Application Level system can be more easily done. A simple “recalibration” of what GRI regards as “advanced” or A+ level report could translate into higher quality in sustainability reporting.

Likewise, the limitations of organizational-level sustainability performance could be more rapidly overcome if the GRI framework or a partnering institution like ICMM were more effective – and explicit – in encouraging organizations to publish facility-level reports as well. For this and other purposes, more studies will be necessary. The identification and discussions of the barriers in this chapter reflected the sample of interviewees and literature reviews.

## 6.5 Summary

This chapter answered the second research question: what are the key practical and conceptual barriers to implementing the need changes in the GRI framework? It identified and discussed the challenges involved in the implementation of six new elements to the GRI G3 that could help mining corporations' reporting processes further meet the Bellagio Principles discussed in Chapter Four. The analysis was informed by literature reviews and interviews. A tentative diagram of the various motivational, structural, and specific barriers to filling those gaps was identified and discussed, thus bringing more texture to the growing debate about the potential ways to overcome the limitations of the GRI G3.

Scholars have been concerned about the negative consequences of sustainability reports based on the current GRI model, but few are trying to understand how to enhance that framework. Although it does not cover all of the important deficiencies of current reporting, this chapter has provided one of the most comprehensive explorations of the many challenges that should be considered in such a process. The implications are many and diverse. Several actors in the mining sector and elsewhere can use the information above. The following chapter will specify some practical implications for companies, standard setters, industry associations, investors, communities, and other users of sustainability reports.

## **Chapter 7 Conclusion**

### **7.1 Introduction and Overview**

The world is witnessing dramatic increases in population growth, material consumption, social inequality, urbanization, and industrialization that are translating into dangerous pressures on the planet's living resources. Such problems have been triggering debates about how to make economic growth compatible with ecological integrity. The concept of sustainable development emerged amidst these discussions as a powerful and influential vision to work towards. Many of the world's largest mining corporations, in line with a global corporate trend, claim to have embraced that concept while trying to make the business case for a sustainable mining industry. To track and communicate progress towards that vision, mining corporations have started to publish sustainability reports based on the GRI framework.

Many scholars have argued that the GRI framework can mislead sustainability decision-makers or even camouflage unsustainable practices. Few scholars, however, have gone far beyond criticism to understand how to enhance that framework. This thesis has addressed this gap, while exploring two major questions: 1) What needs to be changed in mining corporations' approaches to assessing and reporting sustainability for the purpose of promoting more meaningful and reliable disclosures? 2) What are the key conceptual and practical barriers to implementing those changes?

Two general and thirteen specific objectives were created to help answer those questions. The research followed a qualitative grounded theory approach. Data were collected through extensive literature reviews, 41 semi-structured interviews and content analyzes. The evaluation of data included software-aided techniques such as iterative coding, memo-writing, and diagramming.

The thesis started by providing a background on corporate sustainability accountability in the mining sector. The history and contested definitions of concepts such as sustainability,

accountability, stakeholder, corporate social responsibility, mining, mineral reserves, amongst others were reviewed. The research then described the mineral sector and emphasized the need to further investigate the sustainability disclosures of mining and metal corporations.

Chapter Four answered the main research question while evaluating the extent to which sustainability reporting, as proposed and practiced by mining companies, addresses eight principles of sustainability assessment and communication. The chapter highlighted the key changes that need to be implemented in the reporting frameworks of mining corporations for the purpose of promoting more reliable and meaningful disclosures of sustainability performance. Following, Chapter Five addressed a recent industry initiative that is trying to promote more reliable sustainability reports among mining corporations: the ICMM Assurance Procedure. An analysis of the extent to which that procedure can contribute to increased trust in mining companies' sustainability reports was undertaken. It was found that the procedure is likely to drive some further steps towards compliance with the GRI framework and enhance the reliability of specific data-generating processes. Nonetheless, in doing so, it might reinforce an ineffective approach to reporting contributions to sustainability. Chapter Six identified and discussed the many barriers that may emerge in the implementation of more robust sustainability reporting frameworks, thus answering the second research question. These barriers were arranged according to motivational, structural, and specific categories. Overall, these barriers suggest that the challenge of strengthening sustainability reporting depends first on motivation, and then on a wide range of cooperating efforts from various actors in the mining sector and elsewhere.

The findings and discussions of the previous chapters have many conceptual, theoretical, and practical implications, which were highlighted throughout the text. The following sections elaborate on the most important ones. Given the pragmatic underpinning of this research, particular emphasis is given to the practical implications for social groups involved in sustainability reporting.

## 7.2 Conceptual and Theoretical Contributions

This thesis has responded to Parker's (2005) call for normative theory building in sustainability reporting. The previous chapters represent an effort to go beyond descriptions and explanations of past practices to understand the desirable approach to reporting mining corporations' contributions to sustainability. Chapter Four has shown that the fields of ecological and natural resources management (where the Bellagio Principles have been traditionally applied) offer numerous insights that can help build a normative sustainability reporting system for mining corporations and other business actors.

This thesis has also contributed to the ongoing conceptual development of corporate sustainability. As Chapter Three discussed, there have been debates about the extent to which corporate sustainability differs or should differ from more traditional conceptualizations of business ethics, such as corporate social responsibility. Scholars from the fields of management, accounting, and economics seem to be converging towards the idea that corporate sustainability implies a broader ethics, one that includes not only eco-efficiency and social responsibility, but also material sufficiency and ecological justice (Dyllick & Hockerts, 2002). The previous chapters addressed corporate sustainability through the lenses of accountability, trying to explore the complexities involved in assessments and disclosures of corporations' contributions to sustainability. By using principles that have traditionally been used in ecological and natural resources management studies (BellagioSTAMP), this research added more texture and complexity to the debates. The ongoing conceptualizations of corporate sustainability in the literature seem to be pursuing a simple framework or explanation of what a sustainable corporation should look like: "one that balances three bottom lines", "one that protects the environment and listens to stakeholders", etc. While discussing the need for geographical context and scales to understand implications to sustainability, this thesis has argued for a future in which MNCs or TNCs should be conceptualized as an entity with both positive and negative roles in sustainable development. It was argued in sections 3.5.2, 4.4.3, 4.4.4 and 6.2.1.2 that mining operations' interactions with communities and ecosystems vary across geographical regions and scales.



No influential prescriptive theory of corporate sustainability has yet been developed. Some scholars have argued for a multi-layered, situational, systemic framework of corporate sustainability (Marrewijk & Hardjono, 2003; Marrewijk & Werre, 2003). But these ideas have had very limited impact so far. This thesis concurs on the value of elaborating on them.

Some of the findings of this thesis have also implications to the use of explanatory theories in the field of social and environmental accountability. As discussed in section 3.4.1, scholars have been trying to explain the non-financial reporting phenomenon through theories such as social contract, stakeholder theory or legitimacy theory. Most studies of this kind aim at identifying a single theory or explanation for reporting. The longitudinal studies of Guthrie and Parker (1989) and Roberts (1992) examining decades of non-financial reporting at BHP Billiton are notable examples. Those authors tried to understand whether BHP's disclosures could be explained by legitimacy theory. This thesis identified that mining companies are starting to publish local sustainability reports and that future development in this field is likely to entail not only local-level, but also regional and country-level reports. In light of these findings, scholars should re-evaluate the appropriateness of overarching explanations. Sustainability reporting is becoming a multi-faceted phenomenon that will probably be better explained by pluralistic theoretical frameworks. The business units or facilities that make up a corporation may demand particular explanatory theories or even a combination of them.

This thesis has also shed light on the need for more critical conceptualizations of sustainability context, integration, and materiality. The discussions of the barriers to assessing the interactions of mining corporations with the external environment revealed some confusion related to what "context" implies or means. Some interviewees were clearly associating context with materiality or relevant issues. This confusion might explain in part why GRI reporters are not implementing the Sustainability Context principle. Similarly, Chapter Six identified the need to better understand the concept of sustainability integration. Integration, in corporate sustainability reporting, has different connotations from the ones used in sustainability assessments of ecosystems and proposed projects.

Significant barriers to a sounder conceptualization of sustainability in reporting frameworks were identified in the previous chapter, but so were reasons to overcome them. Not only scholars, but numerous actors currently participating in the promotion, implementation, use, and verification of sustainability reports will have a role to play in this challenge.

## **7.3 Practical Contributions**

### *7.3.1 Implications for Standard-setters*

#### 7.3.1.1 The Global Reporting Initiative Institution

This research is valuable to hundreds of stakeholders involved in the continual improvement of the GRI framework. The chapters above, although focusing on the perspectives of mining corporations, adds to the general discussions on how to better evaluate and communicate the contributions of organizations to sustainability. Chapter Four summarized in Table 4-6 a number of specific issues that GRI should consider in its agenda.

This thesis does not argue for an immediate incorporation of those issues into the GRI G3, so that a new and stronger “GRI G4” may soon arise. The changes proposed in that Table are mostly relevant in the mining context. Moreover, they are very challenging; they demand more studies and debates surrounding their acceptability and specific implications for the design and revision of technical protocols, supplements, principles, and guidance documents.

GRI, and its partners, have been proactively researching new possibilities for sustainability reporting. GRI’s Current Priorities webpage indicates the most relevant ones (GRI, 2009a). One of the key implications of this thesis is to draw the attention of those involved in the design of the GRI framework to the fact that their current research priorities deserve a re-evaluation. Some of the key issues in Table 4-7, such as the need for scale-based conceptual frameworks, integration, and forward-looking evaluations, are largely marginalized in the current debates.

Chapter Six has provided an initial understanding of the barriers that may arise in the implementation of some of those “overlooked” issues. Despite its brevity and limitations, that chapter has relevant implications. The barriers related to imbalanced stakeholder representation and path dependence in GRI’s governance system indicate the need for institutional improvements in GRI. The future of its main product, the GRI G3, will reflect the dynamics of its key constituencies. GRI should critically analyze the potential implications of the predominance of business and financial actors in its fabric.

Furthermore, the structural barriers discussed in Chapter Six imply need for more partnerships with different standard setters, policy makers, industry associations, and international organizations. GRI’s mission is a rather challenging one. The world has literally hundreds of thousands of organizations of various types, purposes, sizes and cultures. The standardization of approaches to sustainability reporting across this spectrum of actors entails a myriad of challenges. Sector supplements are a step in the right direction; but just “a” step. The “informal” supplements to GRI reporting that have been emerging in past years, such as the CERES’ Facility-level Reporting Guidelines and the AA1000AS, suggest the following: 1) GRI does not have institutional capacity to address everything that sustainability evaluations and reporting demands; and 2) different organizations are trying to fill the gap. This situation is, of course, implicit in current practice. But perhaps if GRI recognized this issue and put forward a strategy to foster more synergistic collaborations, sustainability reporting would develop more rapidly and efficiently.

The mineral sector offers numerous opportunities for collaborations between GRI and other organizations promoting voluntary standards. A recent study presented in the 2009 World Economic Forum identified almost 30 voluntary social and environmental global initiatives affecting the mining sector that should be considered in future partnerships (Behrendt, et al., 2009). As previously mentioned, GRI is already collaborating with some of these initiatives (e.g. ICMM, IFC, Global Compact, etc.), but there are many additional opportunities.

For example, the implementation of levels or scales of reporting could be more easily realized by establishing partnerships with other standard-setters as well as with governmental

organizations with different focuses on local, regional, and global issues. Table 7-1 below outlines a number of regulated and non-regulated instruments that make up this constellation of potential synergies. Among the clearest opportunities for collaboration, according to a mining sustainability expert, is the development of a reporting system linking mine certification schemes with corporate reporting (ME-2).

**Table 7-1 - Scales of Non-regulated and Regulated Socio-environmental Tools**

Scale	Non-regulated Initiatives	Regulated Instruments
Global	UNEP GEO 4, Millennium Ecosystem Assessment, GRI G3, GRI MMSS, AA1000AS, ICMM programmes and declarations, World Mines Ministries Forum (WMMF).	Multilateral Agreements, Environmental Treaties and Protocols.
Regional or National	Extractive Industry Transparency Initiative (EITI), World Mines Ministries Forum (WMMF), GRI National Annexes (to be developed).	Stock-market Filings (e.g. SEC forms), National Policies and Plans, Strategic Environmental Assessments.
Local (large and medium-size scales)	Towards Sustainable Mining (MAC), Enduring Value (MCA), IFC Performance Standards, Kimberley Process, ISO 14000 series, SA 8000, OHSAS 18001, AA1000AS, Cyanide Management Code, Initiative for Responsible Mining Assurance (IRMA), CERES' Facility-Level Reporting Guidelines.	Licensing and Environmental Approval Instruments, Environmental Impact Assessments, Master Plans, Urban Plans.
Local (small scale)	e3plus (PDAC), CASM Programmes, Diamond Development Initiative, Kimberley Process.	By-laws, Master Plans, Local Impact Assessments and Follow-ups.

The development of collaborative sustainability indicators systems linking all these initiatives is very challenging. It raises numerous questions: does GRI have enough technical capacity and legitimacy to coordinate such an ambitious idea? If not, who would have it? ICMM? UNEP? A new institution? This thesis did not try to answer these questions but to show the value of seeking answers to them.

Some of the barriers raised in Chapter Six have more practical and short-term implications. The best example is the potential side-effects of GRI's Application Level System. As discussed, that system may have an unintended consequence – inhibiting reporters to go beyond the A+ level – which is arguably simple to fix. GRI or another institution could create additional levels (e.g. A++, A+++ or Diamond, or any other symbol that may encourage

progress) to reward reporters that, for example, implement the Sustainability Context principle, and facility-level reports as well. This simple technical change in the protocol should be considered in the near future.

#### 7.3.1.2 Mining Industry and Commodity Associations

The implementation of changes in the GRI guidelines (the framework's main element) is more difficult than in technical protocols and supplements. The guidelines are supposed to attend the reporting needs of all sorts of organizations and sectors. Changes in its structure demand more discussions and evaluations about implications across different contexts. Several interviewees, although agreeing on the value of promoting the changes of Figure 6-1, argued that it should not be made a "global" standard yet (RO-1, IC-3, IC-6, MA-1, MA-4).

This situation indicates an opportunity for other standard-setters such as mining associations to proactively develop additional supplements and guidance documents that, in combination with the GRI guidelines, become applicable to different contexts of the mining sector. The development of the MMSS – the outcome of collaboration between ICMM and GRI – illustrates the realization of such an opportunity. Nonetheless, the MMSS attends mostly the needs of large corporations reporting organizational-level issues globally. Additional supplements could be developed.

Canada, one of the world's leading mineral producers, offers clear opportunities. For example, the Mining Association of Canada currently promotes its own sustainability and assessment and reporting framework – the *Towards Sustainable Mining* (TSM) – that is applicable to member companies operating in Canadian territory (Mining Association of Canada, 2009). MAC's framework is considerably different from GRI's. TSM focuses on a few issues at the facility-level. Nonetheless, as an interviewee has put it, "TSM actually does a better job for that [driving change] than the GRI" (RD-4).

Some of the people interviewed in this research who were involved in some respect in Canadian mining operations revealed conflicting views on how the relationships between GRI and TSM should be developed. One participant argued that TSM should be revised to become more compatible with GRI (MP-5). Another one argued that GRI should adopt TSM's verification system (MP-3). This situation indicates the need for more studies on how the two frameworks can effectively evolve to foster more meaningful and reliable information about mining companies' sustainability performance. A consultant believes that TSM may be "the *glue*, in a way that it might connect the global, the corporate to the facility-level"(IC-6). The same argument could apply to the Prospectors and Developers Association of Canada (PDAC), whose *e3plus* framework (PDCA, 2009) although focusing on exploration, could be the bridge for sustainability evaluations of small-scale junior and exploration operations. In fact, each national mining association could develop additional national frameworks to complement the limitations of GRI.

The potential avenues through which these synergies may happen need further investigation. The Minerals Council of Australia, for example, when revising its reporting framework (Enduring Value), decided to mirror GRI's rationale in the operational level (MCA, 2010). But the same logic may not be applicable to Canada, as this country's mining institutions are embedded in contexts that may require different approaches.

Another implication of this thesis is in Chapter Five. Its discussions are particularly valuable to ICMM, as it analysed the Assurance Procedure that the Council is trying to enforce among its members. The chapter identified a number of gaps in the procedure that should be considered in its future revisions. That chapter as a whole helped to show that the issue of "credibility" may be related to the limitations of the GRI framework, and that trust in its members' reported information may depend on further enhancements in the GRI framework.

Mining associations should further investigate how to manage change towards a stronger sustainability framework. This is, of course, a delicate process. As discussed in Section 6.3.1.3, the current framework is still perceived as demanding. ICMM's latest progress report revealed that less than 50% of its current 19 member companies publish GRI A+ reports (ICMM,

2010d, p. 27). Most mining corporations are still learning how to report organizational, non-contextual sustainability issues. The representative of one mining association argued that further changes in ICMM's framework would not be appropriate right now: "Once you've got to the point where people have really internalized and understood the application of the GRI framework, then that's where you get to the point of getting to the conversation" (MA-4).

It should be noted that the "current situation" is just one of the many factors that should be considered in strategies for change. The literature on change management for sustainable development offers several options on how to strategize such processes (e.g. Benn & Dunphy, 2007; Dopetl, 2003; Drori, et al., 2006; Dunphy, et al., 2007; Elzen, et al., 2004; Hitchcock & Willard, 2006, 2008; Schmandt, et al., 2000).

### *7.3.2 Implications for Mining Corporations' Management*

Senior managers of large mining and metal companies (particularly those involved in CSR and corporate communications and strategy) are among those who will benefit most from this research. The chapters above addressed a very relevant practical question that they currently face: how to better track and communicate progress towards sustainability? This thesis argued that the answer to this question is a very difficult one.

Chapter Four provided a thorough analysis of the limitations of the current GRI framework currently used by mining companies. It shows that complying with that framework is not sufficient for understanding the contributions of mining corporations to sustainable development. If corporate managers are serious about their companies' stated missions and values regarding sustainable development, they will need to go far beyond what they are currently trying to do.

The challenge is enormous. As previously mentioned, most large mining companies are not even complying with the GRI framework. About 70% of the 2009 GRI reporters did not engage with their stakeholders to identify material indicators to report on (Figure 3-11). Less

than 40% sought external assurance and perhaps none tried to implement the sustainability context principle. Managers of mining companies that still publish B or C Level GRI reports need to realize that their gaps will not be over by achieving a GRI A+ report. Chapter Four has given a better sense of the challenge ahead and Chapter Six identified some of the issues that should be factored in strategies towards more meaningful disclosures.

More financial and human resources are likely to be needed. The issues raised by interviews suggest that the reporting's demands have been increasing at a greater pace than the available resources. Managers should consider training employees at their operational facilities to undertake local sustainability assessments and reporting, and also hire more people to help with these processes. But, as one of the mining directors (MP-2) argued, they need to hire the "right" people, i.e. people who know what sustainability is.

*Quite often what happens is that company give the reporting to the PR [public relations] department. And that's the wrong place for this to happen. It is a complex area, it is not like a single discipline, it is a multi-discipline, that requires technical skills, but also strategic thinking, and big picture thinking. And it is that complexity more than anything else that makes it quite hard to report. Because it takes everything from CO<sub>2</sub> that they produce to what is the age profile of your employees. (MP-2)*

In enhancing their reporting, managers need to innovate and create new ways to gather and analyse data. An "ideal" sustainability framework has not been developed yet, and, given the lack of motivation discussed in Chapter Six, it is unlikely to be designed any time soon. Companies need to consider developing unique tools in partnerships with players like local governments and community associations. Many of the specific barriers to enhancing reporting discussed in Section 6.3.3 are associated with fuzzy responsibilities for the generation of contextual data. On many occasions, the interviewees argued that a single company should not be solely responsible for the production of data beyond their fences. This is a reasonable argument that indicates the need for more collaborative approaches to sustainability reporting.

These partnerships and innovations will, of course, demand more efforts from mining companies. But, according to one of the interviewed managers, companies might not be willing to take up additional roles:



*I think that individual mining companies may not want to put the extra resources into doing that kind of research, and reporting. Because our business is mining, not reporting. In my particular department we have to keep that in mind, that our business is mining. We are not a NGO or a government organization. So those things [stronger reporting requirements] might be better if left to NGO or governmental organizations. (MP-5)*

This statement was corroborated by a Mining Association representative who argued that “Dollars are not an infinite resource. For every dollar a company spends on reporting, that’s a dollar less that actually goes into capacity building and delivery” (MA-2).

It should be noted that some progressive mining companies are already developing more robust approaches to reporting. The growing number of facility-level reports hints at this phenomenon. Moreover, one of the NGO representatives (MN-2) contested the “lack-of-money” argument by saying that mining corporations have “all” the financial resources that are needed to enhance reporting. His argument, while unsupported, draws attention to the overlooked financial aspects of reporting.

Very few studies have tried to understand the costs of sustainability reporting and, let alone, the costs of going beyond GRI reporting. A few authors have shown interest in the financial implications of sustainability for the mining industry, but not as they relate to the particular issues of sustainability reporting within corporations (Esteves, 2008; D. Humphreys, 2001). Corporate managers and directors should seriously consider undertaking more strategic budgetary assessments of their sustainability assessments and reporting processes.

Meanwhile, mining companies need to re-evaluate the rhetoric of their sustainability reports, and aim at more realistic, precautionary, and candid disclosures about the effectiveness of their efforts. The pictures of smiling faces, thriving nature, animals, etc. combined with the predominately upbeat tone of the texts – which are common in current practice – may suggest that mining operations are on the right path to sustainability. For example, the CEO and the chair of the board of a mining company stated that they were looking forward to publishing more GRI reports as the company “continues on the path to sustainable development and a

promising future” (Freeport-McMoRan, 2008) The “reality”, as this thesis has argued, is that companies do not have robust sustainability indicator frameworks in place to support such claims. One interviewee who was involved in some of the world’s most relevant mining sustainability initiatives emphatically agreed that there has been a “misuse” of the rhetoric of sustainability to portray an optimistic but unsupported path towards sustainable development. As he explains:

*I do think that along the way they [mining companies] lost sight of the fact that they were only contributors to sustainable development, and they could not really deliver sustainable development, that they needed sort of position their activities within that context, but that was only part of the equation. So, I think that most people working in mining companies are not linguistic analysts, most of them are not terribly careful with their rhetoric, except when it comes to engineering and financial matters. I do think that there has been a misuse. But also I do think that to some extent ICMM companies, some companies are being a little bit less confident about the sustainability rhetoric and preferring to go back to the CSR rhetoric. So I think it is going the other way actually. But it is difficult to measure. (RD-4)*

The perception from this interviewee is interesting. It suggests that as companies become more mature and educated about the implications of sustainability, they realize the complexity of the challenge and become more humble about their efforts.

### *7.3.3 Implications for External Verifiers*

External verifiers should also be more careful with their rhetoric. Assurors ought to avoid statements like one given to AngloGold Ashanti, which concludes that the company’s GRI report “(...) fairly reflects all material aspects” (Ashanti, 2007, p. 12), and from Newmont, which concludes that “(...) the report includes the information that is necessary to describe fairly and adequately how Newmont is managing the material issues related to its sustainability performance (...)” (Newmont, 2007, no page number). Such statements can mislead readers to believe that the mining company is adequately “managing” sustainable development in its realm of operations. As previously discussed, assurors need to be very specific and explicit in the scope and criteria of verification, and base their conclusions in light of those limitations.

Chapter Five has several findings that are important to auditors who are working with verifications of sustainability reports, particularly those in accountancy and consultancy firms. Some of these firms will be hired to verify ICMM companies' sustainability reports and thus apply that procedure. The whole chapter is in itself a useful introduction to the strengths and weaknesses of that document. For example, the chapter highlighted the importance of going beyond the ICMM Procedure's minimal requirements and, for example, consulting external stakeholders to have a better understanding of mining companies' reported performance. The chapter also highlights the fact that assurers are endorsing full compliance with the GRI G3 framework, while overlooking the Sustainability Context principle. In addition to becoming vulnerable to liability issues, assurers may be further legitimizing unsupported claims of positive progress towards sustainability.

The other chapters are also important to verifiers while drawing attention to the complexity of sustainability assessment and communication. Accountancy and consultancy firms need to realize that sustainability requires different skills than the ones traditionally necessary in the verification of environmental, health and safety management systems. More training and capacity building will be necessary, although this process will not be an easy one.

One of the certified GRI trainers noted that in the United States reporting organizations are having difficulty finding auditors and assurance firms with expertise in sustainability (CC-5). Globally, companies also face the challenge of identifying competent individuals and firms to provide these services. As opposed to financial assurance, which has been developing for centuries, sustainability assurance is just beginning. The needed competencies to provide these services are still unclear. The International Register of Certified Auditors is arguably the only institution that currently offers a certification program for Sustainability Assurance (IRCA, 2009). Yet this program is based on a particularly standard (AA1000AS) that does not necessarily address all the complexities involved in the evaluations of sustainability. Professionals of various backgrounds in auditing and social and environmental disciplines are filling this gap, but they are not necessarily prepared for that role. Further research in this field is urgent.

### *7.3.4 Implications for Readers and Users of Sustainability Reports*

#### 7.3.4.1 Stock Market Investors

GRI reports are one of the main sources of information used in the growing fields of ethical or socially responsible investment. Right after the first GRI framework was launched, scholars realized that GRI reports would play a strong role in the investment community (Willis, 2003). Indeed, most research and financial organizations that create or sell ethical funds and indexes today are drawing information from GRI reports (e.g. EIRiS, 2010; FTSE, 2010; GMI, 2010; Jantzi Sustainalytics, 2010; KLD, 2010; SAM, 2010; Trucost, 2010; VIGEO, 2010). Recently, the influential Group of Eight (G8) formally endorsed the relevance of GRI in screening investments (PRLog, 2007). And so did the United Nations, whose Principles for Responsible Investment, explicitly “[a]sk for standardised reporting on ESG issues (using tools such as the Global Reporting Initiative)” (UNEP, 2010, no page number).

Accompanying the growing use of GRI reports in the screening of investments have been concerns about the reliability of such documents, which have long been mistrusted as public relations or greenwashing (Laufer, 2003; Weber, et al., 2008). The debates surrounding this problem usually address the need for external verification or mandatory disclosures (GRI, 2009e; Laufer, 2003). This thesis adds to this debate in a number ways, as many of the analysed mining and metal companies here are listed in stock markets, thus having their GRI reports scrutinized by the investment community (Nazari, 2010).

The discussions in Chapter Five provided more evidence that external verification does not necessarily assure the reliability of sustainability performance. Mining companies can place several restrictions on the work of assurers to portray the image of a responsible or sustainable company. A GRI report with a plus sign (+) is not necessarily more reliable than the others; investors should consider this fact when screening GRI reports, and be attentive to the specific scope and criteria used in verifications. This chapter did show, however, that the introduction of the ICMM Assurance Procedure may promote more reliable disclosures. Investors should expect the future GRI reports from ICMM member companies to carry a greater degree of reliability in specific data sets.

The main contribution of this thesis to the investment community is in Chapter Four which argues that mining companies' GRI reports are still unable to indicate the extent to which companies contribute or not to sustainability. Those reports may indicate organizational performance on various social and environmental issues, ethical commitments, but not "contributions" to sustainability. This is relevant, because many ethical funds that draw on GRI reports are being marketed today as "sustainability" ones, thus suggesting that they reflect the performance of companies contributing to sustainability. A person or enterprise that decides to add "sustainability" funds into their portfolio might believe that they are also contributing to sustainability in some way, but there is no evidence whatsoever of such a link. This thesis, along with other scholars (Gray, 2005; Milne, et al., 2009), argues that "words matter", i.e. GRI reporters, verifiers and the investment community should be mindful of the concepts they use.

#### 7.3.4.2 Local Audiences, Community Representatives, and NGOs

Sustainability reporting has been implemented in a top-down approach by mining companies' headquarters. While this reporting process considers community issues (which is a category of indicators in the GRI framework) it rarely leads to the publication of local or facility-level sustainability reports. As Chapter Four has argued, this situation reflects to a great extent the limitations of GRI G3's organizational issues-based structure. Recent surveys investigating disclosures of community impacts have found that these pieces of information have been limited, elusive, and meaningless for sustainability decision-making (GRI, 2008b; Tsang, et al., 2009).

This thesis found that mining companies are trying to overcome this gap by promoting facility-level reports as well. Some interviewees argued that there seems to be a trend towards the publication of local reports.

Table 3-2 corroborated this trend by identifying nine large mining companies producing some kind of facility-level reports. Although important, these incipient disclosures are following a highlight approach. These reports are not trying to understand the “interactions” of the mining operations with the environment and communities; their approaches have been predominately one of disclosing “the main positive corporate initiatives being promoted”.

Section 6.3.3.2 added important information to this debate, while identifying the existence of limited pressures and interest from stakeholders (particularly local ones) as a key barrier to more sustainability reporting at the local level. Several interviewees believe that if locals were demanding or pressuring for sustainability disclosures, this would happen more often (ME-1, ME-5, MA-1, CC-5, CC-4, IC-2, IC-4, and MP-3). This finding suggests that local actors, such as government and community representatives, need to be informed about the potential benefits of sustainability reports, so that they can demand or pressure for such documents. The same argument applies to NGOs. This thesis only interviewed four NGO representatives located in four different countries. This sample is largely insufficient to generalize statements about these types of organizations. Nonetheless, along with the lack of published material, the interviews do suggest that NGOs are not sufficiently informed about the limitations of mining companies’ reports and external verification. This situation raises the need to further understand the following issues:

- who should educate local audiences and NGOs about the potential benefits of enhancing sustainability frameworks and external verification?
- should local disclosures be based on the GRI as well?
- are there opportunities for incorporating sustainability reporting in local, regional/national regulations?

#### **7.4 Limitations and Recommendations for Future Research**

The questions raised in the last section address just a fraction of the many problems that should be considered in the avenues towards the development of sustainability reports that can inform decision makers about the potential contributions of mining companies to sustainable

development. Sustainability reporting has a very short history of both application and theorization. This thesis, as with many exploratory studies, presented more questions than answers. The changes proposed to mining companies' reporting frameworks and the barriers to implementing them hinge on numerous factors of various natures (e.g. conceptual, technical, procedural, institutional, political, and economic) that demand further investigation. Not only scholars, but also professionals in consultancies, mining companies and associations, need to participate in this research agenda.

Researchers can start by contesting and debating the many arguments put forward here. The chapters above represent one of the first attempts to go beyond description and criticism to understand the challenges involved in the design of sounder sustainability frameworks for mining corporations. The findings, however, reflect the conceptual/theoretical framework, the sample of interviewees, the investigator's background, among many other factors. One might find other ways to investigate the research problem that may lead to different results. This would be welcome, as additional perspectives can considerably enrich the debate.

This thesis has undertaken a "macro" analysis of sustainability reporting among mining corporations. Such an approach on the one hand enables a more comprehensive understanding of the many issues involved in the problem, but on the other hand misses more nuanced phenomena happening within particular mining corporations. During the research it became clear the existence of large mining corporations proactively innovating their approaches to sustainability assessment and reporting. In-depth case studies with such companies, grounded by interviews with employees in the head office and operational units, should yield relevant insights.

Scholars will have a particularly strong role to play in understanding how the specific barriers to embedding context and integration in sustainability disclosures can be overcome. As discussed in Sections 6.3.3.1 to 6.3.3.3, there is very limited and inconclusive knowledge of how to design a sustainability indicator system that enables an understanding of mining operations' interactions with the environment across different geographical regions and scales. During the research not a single method for weighting and aggregating the many sustainability

roles of corporate operations across the globe was found. The overall majority of methods yet developed apply to carbon emissions, geographically-bounded operations or to the indexation of non-contextual organizational issues.

This gap opens avenues for various quantitative studies involving multiple disciplines such as information technology, mathematics, geography, and economics. Given that “sustainability is an inherently vague and complex concept and cannot be described, let alone measured, by traditional mathematics” (Phillis & Kouikoglou, 2009, p. 11), such studies should consider the application of fuzzy logics in their methodological developments (Musee & Lorenzen, 2007; Phillis & Andriantiatsaholiniaina, 2001; Phillis & Kouikoglou, 2009; Yu, et al., 2005).

One of the choices made in this research that most significantly affected the results was the use of the new Bellagio Principles to evaluate the gaps in the GRI framework being used by mining companies. As discussed in Section 4.3, this choice mirrors a number of assumptions. This thesis is confident in the appropriateness of the BellagioSTAMP for judging the GRI framework. Moneva and others (2006), when analysing the limitations of the GRI G2 framework adopted similar criteria that led to similar results. This debate, however, can be enriched if researchers further evaluated the implications of those principles for the development of improvements in the GRI structure. For example, Section 4.4.4 proposed a scale-based conceptual framework to guide the reporting process of mining corporations that is somewhat subjective. Different schools of thoughts might have competing ideas about how to design a systemic, scale-based conceptual framework.

Researchers should elaborate on the barriers identified in Chapter Six. Those barriers trigger many practical questions that deserve further investigation through more focused or quantitative techniques. For example, surveys and Delphi studies could both confirm and refine the relevance of those barriers in more specific situations.



## 7.5 Conclusions

Large mining corporations' growing efforts to assess and report contributions to sustainable development are both praiseworthy and worrying. These practices are helping to infiltrate sustainability in their fabrics, but, at the same time, promoting information that can mislead decision-makers. This thesis has tried to understand how to generate more meaningful and reliable reports, while exploring the requirements and barriers to strengthening mining corporations' sustainability reporting frameworks. Overall, the findings corroborate Nola Buhr's argument that the pathway to an "ideal" reporting system might be disputed and much longer than many would like (Buhr, 2007).

To further strengthen sustainability reporting, mining corporations will need to go beyond external verification and A+ Level in the GRI framework, to consider context, scales, long-term effects (legacy), interactions, trade-offs, synergies, amongst other requirements discussed in Chapter Four. The barriers to implementing these requirements are many and diverse. Mining corporations cannot overcome them on their own. Numerous actors need to participate and collaborate in this process of change and learning.

This thesis represents an effort to map important issues to be considered by companies, governments, standard-setters, industry associations, and other mining stakeholders. In light of current knowledge and practice, some issues might appear as intimidating. One needs to bear in mind, however, that far more intimidating are the potential consequences of not effectively progressing towards sustainability.

## REFERENCES

- ACCA. (2004). *Towards transparency: progress on global sustainability report 2004*. London: Association of Chartered Certified Accountants.
- AccountAbility. (2003). *AA1000 Assurance Standard*. London: AccountAbility - Institute of Social and Ethical Accountability.
- AccountAbility. (2005a). Stakeholder Engagement Standard.
- AccountAbility. (2005b). *Stakeholder Engagement Standard: Exposure Draft*. London: AccountAbility.
- AccountAbility. (2008a). *AA1000 Accountability Principles Standard 2008*. London: AccountAbility UK.
- AccountAbility. (2008b). *AA1000 Assurance Standard 2008*. London: AccountAbility UK.
- AccountAbility/BTGroup/LRQA. (2006). *The Materiality Report: Aligning Strategy, Performance and Reporting*. London: AccountAbility, BT Group and Lloyds Register Assurance (LRQA).
- Adams, C. A., & Evans, R. (2004). Accountability, completeness, credibility and the audit expectation gap. *Journal of Corporate Citizenship*, 14, 97-115.
- Adams, C. A., & Frost, G. R. (2006). Accessibility and functionality of the corporate web site: implications for sustainability reporting. *Business Strategy and the Environment*, 15(4), 275 - 287.
- Adger, W. N. (2000). Social and ecological resilience: are they related? *Progress in Human Geography*, 24(3), 347-364.
- Agricola, G. (1912). *De re metallica* (H. C. Hoover & L. H. Hoover, Trans. Latin 1556 ed.). London: The Mining Magazine.
- Alcoa. (2007). *2006 Sustainability Highlights*. New York: Alcoa.
- Ali, S. H. (2003). *Mining, the environment, and indigenous development conflicts*. Tucson: University Arizona Press.
- Ali, S. H. (2006). Gold mining and the golden rule: a challenge for producers and consumers in developing countries. *Journal of Cleaner Production* 14, 455-462.
- Altomare, B. N. M. (2002). *Dancing with the Tiger: learning sustainability step by natural step*. Gabriola Island, BC: New Society Publishers.
- Anderson, D. J. (2010). *The Mineral Footprint (TM) of Green Choices*. Paper presented at the MMSA Minerals for a Green Society Symposium, Feb. 4th, 2010,. Retrieved from <http://www.mmsa.net/GreenSocSymp/02AndersonRedefining-Footprints.pdf>
- Anderson, T. L. (2004). *You Have to Admit It's Getting Better: From Economic Prosperity to Environmental Quality*. Stanford, CA: Hoover Institution Press.
- Andrews, T., Botto, A., Bronson, D., Cooney, J., Forcese, C., Jones, D., et al. (2007). *National Roundtables on Corporate Social Responsibility (CSR) and the Canadian Extractive Industry in Developing Countries - Advisory Group Report*. Ottawa.
- Anglo American. (2007). *Anglo American: A climate of change - Report to Society 2006*. London: Anglo American plc.
- Aras, G., & Crowther, D. (2008). Corporate Sustainability Reporting: A Study in Disingenuity? *Journal of Business Ethics*, 87, 279-288.

- Archel, P., Fernández, M., & Larrinaga, C. (2008). The Organizational and Operational Boundaries of Triple Bottom Line Reporting: A Survey. *Environmental Management*, 4, 106-117.
- Argyris, C., & Schön, D. A. (1996). *Organizational learning II: theory, method and practice*. Reading, MA: Addison-Wesley.
- Ashanti, A. (2007). *AngloGold 06 Report to Society*. Johannesburg: AngloGold Ashanti Limited.
- Ashby, M. F. (2009). *Materials and the Environment: Eco-Informed Material Choice*. Amsterdam: Elsevier.
- Atherton, J. (2007). Declaration by the Metals Industry on Recycling Principles. *The International Journal of Life Cycle Assessment*, 12(1), 59-60.
- Atherton, J., & Davies, B. (2005). *Materials Stewardship - Towards the Sustainable Use of Minerals and Metals*. Paper presented at the European Metallurgical Conference EMC 2005, September 18 to 21, 2005.
- Atkinson, G. (2000). Measuring corporate sustainability. *Journal of Environmental Planning and Management*, 43(2), 235-252.
- Atkisson, A. (2008). *The ISIS Agreement: How Sustainability Can Improve Organizational Performance and Transform the World*. London: Earthscan.
- Aune, J. A. (2007). How to Read Milton Friedman: Corporate Social Responsibility and Today's Capitalisms. In S. May, G. Cheney & J. Roper (Eds.), *The Debate Over Corporate Social Responsibility* (pp. 207-219). New York: Oxford University Press.
- Auty, R. M. (1993). *Sustaining Development in Minerals Economies: The Resource Curse Thesis*. London: Routledge.
- Auty, R. M. (1997). Natural resource endowment, the state and development strategy, *Journal of International Development* (Vol. 9 pp. 651 - 663): John Wiley & Sons, Ltd.
- Auty, R. M., & Mikesell, R. F. (1998). *Sustainable Development in Mineral Economies*. New York: Oxford University Press.
- Ayres, L. (2008). Semi-Structure Interview. In L. M. Given (Ed.), *The SAGE Encyclopedia of Qualitative Research Methods: Volumes 1 & 2* (pp. 810-811). Thousand Oaks: SAGE Publications.
- Ayres, R. U. (1997). Metals recycling: economic and environmental implications. *Resources, Conservation and Recycling*, 21, 145-173.
- Ayres, R. U., Bergh, J. C. J. M. v. d., & Gowdy, J. M. (1998). *Viewpoint: weak versus strong sustainability*. Amsterdam: Tinbergen Institute.
- Azapagic, A. (2003). Systems Approach to Corporate Sustainability. *Process Safety and Environmental Protection*, 81(5), 303-316.
- Azapagic, A. (2004). Developing a framework for sustainable development indicators for the mining and minerals industry. *Journal of Cleaner Production*, 12(6), 639-662.
- Baker, M. (2006). Global Reporting Initiative - Leap forward or last gasp? Retrieved June 30, 2009, from <http://www.ethicalcorp.com/content.asp?ContentID=4164&ContTypeID=>
- Baker, M. (2008). Why CSR reporting is broken and how it should be fixed: Sustainability reporting will undergo a revolution in the next few years. This can only be a good thing argues Mallen Baker. Retrieved June 30, 2009, from <http://www.ethicalcorp.com/content.asp?ContentID=6224&ContTypeID=>

- Baker, M., & Savitz, A. (2008). GRI: sinking or swimming? GRI isn't working for Mallen Baker. Andy Savitz says it's still on track March 6, 2008. from <http://www.ethicalcorp.com/content.asp?ContentID=5755>
- Baljak, J. (Director). (2007). Tegla puna vazduha. Servia.
- Ball, A., Owen, D. L., & Gray, R. (2000). External transparency or internal capture: The role of third-party statements in adding value to corporate environmental reports. *Business Strategy and the Environment*, 9, 1-23.
- Ballard, C., & Banks, G. (2003). Resource Wars: The Anthropology of Mining. *Annual Review of Anthropology*, 32, 287-313.
- Bansal, P. (2005). Evolving sustainably: a longitudinal study of corporate sustainable development. *Strategic Management Journal*, 26, 197-218.
- Barnett, H. J., & Morse, C. (1963). *Scarcity and Growth: The Economics of Natural Resource Availability*. Washington: Resources for the Future.
- Barrick. (2010). GRI Indicator List. Retrieved January 20, 2010, from <http://www.barrick.com/Theme/Barrick/files/ehss/online/2008/en/griindicatorlist/index.html>
- Barrick, Kinross, & Goldcorp. (2009). *Submission to the Standing Committee on Foreign Affairs and International Development. BILL C-300, An Act respecting Corporate Accountability for the Activities of Mining, Oil or Gas in Developing Countries*. Toronto: Barrick Gold Corporations, Kinross Gold Corporations, and Godcorp Inc.
- Basu, A. J., & Kumar, U. (2004). Innovation and Technology Driven Sustainability Performance Management Framework (ITSPM) for the Mining and Minerals Sector. *International Journal of Mining, Reclamation and Environment*, 18(2), 135 - 149.
- Baumgartner, R. J. (2006). *Sustainability performance of corporations: comparison of assessment methods*. Paper presented at the First International Conference on Environmental Economics and Investment Assessment, Mykonos, Greece.
- Bavelas, J. B. (1995). Quantitative versus Qualitative? In W. Leeds-Hurwitz (Ed.), *Social Approaches to Communication*. New York, London: The Guilford Press.
- Baxter, T., Bebbington, J., & Cutteridge, D. (2004). Sustainability Assessment Model: Modelling Economic, Resource, Environmental and Social Flows of a Project. In A. Henriques & J. Richardson (Eds.), *The Tripple Bottom Line: Does it All Add Up? Assessing the Sustainability of Business and CSR*. London: Earthscan.
- Bazeley, P., & Richards, L. (2000). *The NVivo Qualitative Project Book*. Thousand Oaks: SAGE Publications.
- BBC. (2008). *The BBC World Debate: How accountable is business? (TV program featured on September 03, 2008 during the )*. London: The BBC World News.
- Bebbington, J. (2001). Sustainable development: a review of the international development, business and accounting literature. *Accounting Fortum*, 25(2), 128-157.
- Bebbington, J. (2007). *Accounting for Sustainable Development Performance*. London: Elsevier.
- Bebbington, J. (2009). Measuring sustainable development performance: Possibilities and issues. *Accounting Forum*, 33(3), 189-193.
- Bechhofer, F., & Paterson, L. (2000). To interview or not to interview *Principles of Research Design in the Social Sciences*. London: Routledge.
- Becker, J. (2004). Making sustainable development evaluations work. *Sustainable Development*, 12(4), 200-211.

- Beckerman, W. (1995). How Would you Like your 'Sustainability', Sir? Weak or Strong? A Reply to my Critics. *Environmental Values*, 4, 169-179.
- Beckerman, W. (2002). *A Poverty of Reason: Sustainable Development and Economic Growth* Oakland: The Independent Institute.
- Beder, S. (2002). *Global Spin: The Corporate Assault on Environmentalism*. White River Junction, Vermont: Chelsea Green Publishing Company.
- Behrendt, S., Brodeur, A., Kehm, T., Klawitter, J., Mosanya, U., Pley, H., et al. (2009). *The Global Nature of Mining & Metal: "Deep Dive" on Voluntary Principles - World Economic Forum Annual Meeting 2009, Governors Meeting for Mining & Metals*. Davos: World Economic Forum.
- Bell, S., & Morse, S. (2008). *Sustainability Indicators: Measuring the Immeasurable?* (2 ed.). London: Earthscan.
- Beloff, B., Tanzil, D., & Lines, M. (2004). Sustainable Development Performance Assessment. *Environmental Progress*, 23(4), 271-276.
- Benn, S., & Dunphy, D. (2007). *Corporate governance and sustainability: challenges for theory and practice*. London ; New York: Routledge.
- Berg, B. L. (2001a). An Introduction to Content Analysis. In B. L. Berg (Ed.), *Qualitative Research for the Social Sciences*. Boston: Allyn and Bacon.
- Berg, B. L. (2001b). *Qualitative Research for the Social Sciences* (4 ed.). Boston: Allyn and Bacon.
- Berger, A. R., & Hodge, R. A. (1998). Natural change in the environment: A challenge to the pressure-state-response concept. *Social Indicators Research*, 44(2), 255-265.
- Bergh, J. C. J. M. v. d., & Verbruggen, H. (1999). Spatial sustainability, trade and indicators: an evaluation of the "ecological footprint". *Ecological Economics*, 29(1), 61-72.
- Berkes, F., Colding, J., & Folke, C. (2003). *Navigating Social-ecological Systems: Building Resilience for Complexity and Change*. Cambridge: Cambridge University Press.
- Berman, J. E., & Webb, T. (2003). *Race to the top: attracting and enabling global sustainable business*. Washington: World Bank Group.
- Bernstein, D., & Slick, A. (Director). (2008). When Clouds Clear. USA.
- BHP Billiton. (2007). *It's our.... BHP Billiton Sustainability Report Full Report*. Melbourne and London: BHP Billiton Limited and BHP Billiton Plc.
- BHP Billiton. (2009a). *Resourcing the Future: Our Sustainability Framework. BHP Billiton's Policies, Standards, and Commitments*. Melbourne: BHP Billiton Centre.
- BHP Billiton. (2009b). *Resourcing the Future: Sustainability Summary Report 2009*. Melbourne: BHP Billiton Centre.
- BILL C-300. (2009). BILL C-300 An Act respecting Corporate Accountability for the Activities of Mining, oil or Gas in Developing Countries. First Reading, February 9, 2009. Retrieved 05.03.10, from <http://www2.parl.gc.ca/HousePublications/Publication.aspx?Docid=3658424&file=4>
- Billon, P. L. (2005). *The Geopolitics of Resource Wars (Case Studies in Geopolitics)*.
- Blaser, M., Feit, H. A., & McRae, G. (2004). *In the Way of Development: Indigenous Peoples, Life Projects and Globalization*. London: Zed Books.
- Bohman, J. (1999). Theories, Practices, and Pluralism: A Pragmatic Interpretation of Critical Social Science. *Philosophy of the Social Sciences*, 29(4), 459-480.
- Böhringer, C., & Jochem, P. E. P. (2007). Measuring the immeasurable - A survey of sustainability indices. *Ecological Economics*, 63(1), 1-8.

- Bossel, H. (1999). *Indicators for Sustainable Development: Theory, Method, Applications - A report to the Balaton Group*. Winnipeg: International Institute for Sustainable Development (IISD).
- Brereton, D., Moran, C., McIlwain, G., McIntosh, J., & Parkinson, K. (2008). *Assessing the cumulative impacts of mining on regional communities: an exploratory study of coal mining in the Muswellbrook Area of NSW*. Brisbane: Centre for Social Responsibility in Mining, University of Queensland.
- Bringer, J. D., Johnston, L. H., & Brackenridge, C. H. (2006). Using Computer-Assisted Qualitative Data Analysis Software to Develop a Grounded Theory Project. *Field Methods*, 18(3), 245-266.
- Brown, H. S., Jong, M. d., & Lessidrenska, T. (2007). *The Rise of the Global Reporting Initiative (GRI) as a Case of Institutional Entrepreneurship*. Cambridge, MA: John F. Kennedy School of Government, Harvard University.
- Brown, H. S., Jong, M. d., & Lessidrenska, T. (2009). The Rise of the Global Reporting Initiative: a case of institutional entrepreneurship. *Environmental Politics*, 18(2), 182 - 200.
- Brown, H. S., Jong, M. d., & Levy, D. L. (2009). Building institutions based on information disclosure: lessons from GRI's sustainability reporting. *Journal of Cleaner Production*, 17(571-580).
- Brown, L. R. (1981). *Building a Sustainable Society*. New York and London: W. W. Norton & Company.
- Brunner, P. H., & Rechberger, H. (2004). *Practical handbook of material flow analysis*. Boca Raton: CRC Press.
- Bruno, K. (1992). *The Greenpeace Guide to Greenwash*: Greenpeace International.
- Bruno, K. (2002). *Earthsummit.biz: the corporate takeover of sustainable development*. Oakland, CA: Food First Books.
- BSR. (2007). *Beyond Monitoring: A New Vision for Sustainable Supply Chains*: Business for Social Responsibility.
- Buhr, N. (2007). Histories of and rationales for sustainability reporting. In J. Unerman, J. Bebbington & B. O'Dwyer (Eds.), *Sustainability Accounting and Accountability*. London and New York: Routledge
- Bureau Veritas. (2009). Sustainability Report Assurance: Gain stakeholders' trust and enhance your company's reputation. Retrieved 01 July 2009, from [http://www.bureauveritas.com/wps/wcm/connect/bv\\_com/Group/Home/bv\\_com\\_serviceSheetDetails?serviceSheetID=2866&siteID=1&industryID=12&serviceCategoryID=-1&preciseObjectID=-1&divisionID=-1&businessScopeID=-1](http://www.bureauveritas.com/wps/wcm/connect/bv_com/Group/Home/bv_com_serviceSheetDetails?serviceSheetID=2866&siteID=1&industryID=12&serviceCategoryID=-1&preciseObjectID=-1&divisionID=-1&businessScopeID=-1)
- Byrch, C., Kearins, K., Milne, M. J., & Morgan, R. (2007). Sustainable "what"? A cognitive approach to understanding sustainable development. *Qualitative Research in Accounting & Management*, 4(1), 26-52.
- Callahan, K. (2007). *Elements of Effective Governance: Measurement, Accountability and Participation*. Boca Raton: CRC Press.
- Callenbach, E. (1990). *Ecotopia: the notebooks and reports of William Weston*. New York: Bantam Books.
- Cameron, J. (Director). (2009). Avatar. USA/UK.

- Campbell, D. J. (2000). Legitimacy theory or managerial reality construction? Corporate social disclosure in Marks and Spencer Plc corporate reports, 1969-1997. *Accounting Forum*, 24(1), 80-100.
- Capra, F., & Pauli, G. (1995). *Steering Business Toward Sustainability*. Tokyo: United Nations University Press.
- Carpenter, S., Walker, B., Anderies, J. M., & Abel, N. (2001). From Metaphor to Measurement: Resilience of What to What? *Ecosystems*, 4(765-781).
- Carroll, A. B. (1991). The Pyramid of Corporate Social Responsibility: Toward the Moral Management of Organizational Stakeholders. *Business Horizons*, July-August.
- Carroll, A. B. (1999). Corporate Social Responsibility: Evolution of a Definitional Construct. *Business & Society*, 38(3), 268-295.
- Carroll, A. B. (2004). Managing ethically with global stakeholders: A present and future challenge. *Academy of Management Executive*, 18(2), 114-120.
- Casper, J. K. (2007). *Minerals: Gifts From the Earth*. New York: Chelsea House.
- Cavadini, F., & King, M. (Director). (2001). *An Evergreen Island*. Australia.
- CERES. (1989). CERES Principles - Corporate Environmental Conduct. Retrieved September 05, 2009, from <http://www.ceres.org/Page.aspx?pid=416>
- CERES. (2005). *Facility Reporting Project: Sustainability Reporting Guidance - Pilot Draft*. Boston, MA: Ceres.
- Charmaz, K. (2005). Grounded Theory in the 21st Century: Applications for Advancing Social Justice Studies. In N. K. Denzin & Y. S. Lincoln (Eds.), *The SAGE Handbook of Qualitative Research* (pp. 507-535). London: SAGE Publications.
- Charmaz, K. (2006). *Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis*. London: SAGE Publications.
- Charmaz, K., & Bryant, A. (2008). Grounded Theory. In L. M. Given (Ed.), *The SAGE Encyclopedia of Qualitative Research Methods: Volumes 1 & 2* (pp. 374-377). Los Angeles: SAGE Publications.
- Cherryllhomes, C. H. (1992). Notes on Pragmatism and Scientific Realism. *Educational Researcher*, 21(6), 13-17.
- Chu, D., Strand, R., & Fjelland, R. (2003). Theories of complexity. *Complexity*, 8(3), 19 - 30.
- Cieply, M. (2009). Hollywood Grosses Shatter Record. *New York Times*, December 27, 2009.
- Ciullo, P. A. (1996). *Industrial minerals and their uses: a handbook and formulary*. Westwood, NJ: Noyes Publications.
- Collen, B., Loh, J., Whitmee, S., McRae, L., Amin, R., & Baillie, J. E. M. (2009). Monitoring Change in Vertebrate Abundance: the Living Planet Index. *Conservation Biology*, 23(2), 317-327.
- Conservation International. (2010). Partnerships for Responsible Mining. Retrieved January 20, 2010, from [http://www.conservation.org/FMG/Articles/Pages/partners\\_responsible\\_mining.aspx](http://www.conservation.org/FMG/Articles/Pages/partners_responsible_mining.aspx)
- Consolandi, C., Jaiswal-Dale, A., Poggiani, E., & Vercelli, A. (2009). Global standards and ethical stock indexes: The case of the dow jones sustainability stoxx index. *Journal of Business Ethics*, 87(SUPPL. 1), 185-197.
- Cook, P. J. (1997). *The role of the earth sciences in sustaining our life-support system*. London: British Geological Survey
- Cook, P. J. (1999). Sustainability and Nonrenewable Resources. *Environmental Geosciences*, 6(4), 185-190.

- Cooney, J. (2004). The Revolution in the Global Mining Industry. In L. Barreto, J. Cooney & CONACAMI (Eds.), *Global Processes* (pp. 6-7). Montevideo and Ottawa: Mining Policy Research Initiative & International Development Research Centre.
- Cooper, H. M. (1982). Scientific Guidelines for Conducting Integrative Research Reviews. *Review of Educational Research*, 52(2), 291-302.
- Cooper, H. M. (1988). Organizing knowledge synthesis: a taxonomy of literature reviews. *Knowledge in Society*, 1, 104-126.
- Corbin, J. M., & Strauss, A. L. (2008). *Basics of qualitative research: grounded theory procedures and techniques* (3 ed.). Thousand Oaks: SAGE Publications.
- CorporateRegister. (2009). Report Statistics. Retrieved 15 January 2009, from <http://www.corporateregister.com/charts/charts.pl>
- CorporateRegister.com. (2008a). *Assurance View: The CSR Assurance Statement Report*. London: CorporateRegister.com.
- CorporateRegister.com. (2008b). *CRRRA'07: Global Winners and Reporting Trends*. London: CorporateRegister.com Limited.
- Covalence. (2009a). *Extract: Covalence Basic Resources Report*. Geneva: Covalence SA.
- Covalence. (2009b). Mining & Metals Face Growing Ethical Claims - Covalence Basic Resources Sector Report 2009. Retrieved February 02, 2010, from <http://www.covalence.ch/index.php/2009/08/31/mining-metals-face-growing-ethical-claims-covalence-basic-resources-sector-report-2009/>
- Cowe, R., & Timberlake, L. (2008). *Corporate Sustainability in Context: A Pocket Guide (Nearly) everything you always wanted to know about Corporate Sustainability*. Context Group Ltd.
- Cowell, S. J., Wehrmeyer, W., Argust, P. W., & Robertson, J. G. S. (1999). Sustainability and the primary extraction industries: theories and practice. *Resources Policy*, 25, 277-286.
- CPA. (2004). *Triple Bottom Line. A Study of Assurance Statements Worldwide*. Melbourne: CPA Australia's Audit and Assurance Centre of Excellence.
- Cragg, W. (2006). *Mining, the new rhetoric of sustainability, and the emergence of a new social contract"*. Paper presented at the Prepared for the International Studies Conference, March 22-26, San Diego, CA.
- Creswell, J. W. (2007). *Qualitative Inquiry & Research Design: Choosing Among Five Approaches*. Thousand Oaks: SAGE Publications.
- Crowther, D., Carter, C., & Cooper, S. (2006). The poetics of corporate reporting: Evidence from the UK water industry. *Critical Perspectives on Accounting*, 17, 175-201.
- CSI. (2009). True Sustainability Index TM. Retrieved September 15, 2009, from <http://www.sustainableinnovation.org/true-sustainability-index.html>
- CSRwire. (2009). World's First True Sustainability (TM) Announced. Retrieved September 15, 2009, from [http://www.csrwire.com/press/press\\_release/17026-World-s-First-True-Sustainability-Index-TM-Announced](http://www.csrwire.com/press/press_release/17026-World-s-First-True-Sustainability-Index-TM-Announced)
- CVRD. (2007). *Relatório de Sustentabilidade 2006*. Rio de Janeiro: Companhia Vale do Rio Doce.
- Dahlsrud, A. (2008). How Corporate Social Responsibility is Defined: an Analysis of 37 Definitions. *Corporate Social Responsibility and Environmental Management*, 15, 1-13.
- Daly, H. E. (1977). *Steady-state economics : the economics of biophysical equilibrium and moral growth*. San Francisco: W. H. Freeman.



- Daly, H. E., Cobb, J. B., & Cobb, C. W. (1989). *For the common good : redirecting the economy toward community, the environment, and a sustainable future*. Boston: Beacon Press.
- Daly, H. E., Farley, J. C., & NetLibrary Inc. (2004). *Ecological economics: principles and applications*. Washington: Island Press.
- Daly, H. E., Jacobs, M., & Skolimowski, H. (1995). On Wilfred Beckerman's Critique of Sustainable Development. *Environmental Values*, 4, 49-55.
- Dando, N., & Swift, T. (2003). Transparency and Assurance: Minding the Credibility Gap. *Journal of Business Ethics*, 44, 195-2003.
- Danielson, L. (2006). *Architecture for Change: An Account of the Mining, Minerals and Sustainable Development Project History*. Berlin: Global Public Policy Institute.
- Deegan, C. (2007). *Organizational legitimacy as a motive for sustainability reporting*. London: Routledge.
- Deegan, C., Cooper, B. J., & Shelly, M. (2006). An investigation of TBL report assurance statements: UK and European evidence. *Managerial Auditing Journal*, 21(4), 329-371.
- Deegan, C., Michaela, R., & Tobin, J. (2002). An examination of the corporate social and environmental disclosures of BHP from 1983-1997: A test of legitimacy theory. *Accounting, Auditing & Accountability Journal*, 15(3), 312 - 343.
- Deloitte. (2007). *A mine of information. An analysis of sustainable development reporting in the mining industry*. London: Deloitte & Touche LLP.
- Deloitte. (2010). *Tracking the trends 2010: A look at 10 of the top issues mining companies will face*. London: Deloitte Touche Tohmatsu.
- Deloitte/IISD/SustainAbility. (1993). *Coming clean: Corporate Environmental Reporting - Opening Up for Sustainable Development*: Deloitte Touche Tohamatsu International, International Institute for Sustainable Development (IISD), SustainAbility.
- Denscombe, M. (2007). Interviews. In M. Denscombe (Ed.), *The Good Research Guide: for small-scale social research projects*. New York: Open University Press.
- Denzin, N. K. (1978). *Sociological methods: a sourcebook*. New York: McGraw-Hill.
- Denzin, N. K. (1994). The art and politics of interpretation. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 500-515). Thousand Oaks, CA: SAGE Publications.
- Denzin, N. K., & Lincoln, Y. S. (2005). *The SAGE Handbook of Qualitative Research*. Thousands Oaks: SAGE Publications.
- Devuyst, D. (2000). Linking impact assessment and sustainable development at the local level: the introduction of sustainability assessment systems. *Sustainable Development*, 8(2), 67-78.
- Dey, I. (1993). *Qualitative Data Analysis: A User-Friendly Guide for Social Scientists*. London: Routledge.
- DFAIT. (2009). Building the Canadian Advantage: A Corporate Social Responsibility (CSR) Strategy for the Canadian International Extractive Sector. Retrieved April 21, 2009, from <http://www.international.gc.ca/trade-agreements-accords-commerciaux/ds/csr-strategy-rse-strategie.aspx#3>
- Dicken, P. (2007). *Global Shift: Mapping the Changing Contours of the World Economy*. New York: The Guilford Press.
- Diesendorf, M. (2001). Models of sustainability and sustainable development. *International Journal of Agricultural Resources, Governance and Ecology*, 1(2), 109-123.

- Dingwerth, K. (2007). *The New Transnationalism: Transnational Governance and Democratic Legitimacy*. New York: Palgrave Macmillan.
- DJSI. (2010a). *DJSI Sector Overview: MNX Mining*. Zurich: SAM Indexes GmbH.
- DJSI. (2010b). Dow Jones Sustainability Indexes. Retrieved January 10, 2010, from <http://www.sustainability-index.com/default.html>
- Dopetl, B. (2003). *Leading Change Toward Sustainability: A Change-Management Guide for Business, Government and Civil Society*. Sheffield: Green Leaf Publishing.
- Dornum, D. D. v. (1997). The Straight and the Crooked: Legal Accountability in Ancient Greece. *Columbia Law Review*, 97(5), 1483-1518.
- Drori, G. S., Meyer, J. W., & Hwang, H. (2006). *Globalization and Organization: World Society and Organizational Change*. Oxford: Oxford University Press.
- Drucker, P. F. (1993). *Concept of the Corporation*. Edison, NJ: Transaction
- Dudok, O., & Muir, H. a. W. (2006). sustManage - Integrating Corporate Sustainability. In J. Jonker & M. d. Witte (Eds.), *Management Models for Corporate Social Responsibility*. Berlin: Springer.
- Duinker, P., & Greig, L. (2007). Scenario analysis in environmental impact assessment: improving explorations of the future. *Environmental Impact Assessment Review*, 27(3), 206-219.
- Dunphy, D., Benveniste, J., Griffiths, A., & Sutton, P. (2000). *Sustainability: The Corporate Challenge of the 21st Century*. Crows Nest, NSW: Allen & Unwin.
- Dunphy, D., Griffiths, A., & Suzanne, B. (2007). *Organizational change for corporate sustainability: a guide for leaders and change agents of the future* (2 ed.). London: Routledge.
- Dyllick, T., & Hockerts, K. (2002). Beyond the business case for corporate sustainability. *Business Strategy and the Environment*, 11, 130-141.
- Earthworks. (2007). *Golden Rules: Making the Case for Responsible Mining*. Washington and Boston: Earthworks and Oxfam America.
- Earthworks. (2010). International Mining. Retrieved January 20, 2010, from [http://www.earthworksaction.org/intl\\_program.cfm](http://www.earthworksaction.org/intl_program.cfm)
- Ebner, D., & Baumgartner, R. J. (2006). *The relationship between Sustainable Development and Corporate Social Responsibility*. Paper presented at the Corporate Responsibility Research Conference, September 3-5.
- Eccles, R. G., & Krzus, M. (2010). *One Report: Integrated Reporting for a Sustainable Strategy*. Hoboken, NJ: John Wiley & Sons.
- Edelman. (2009). *2009 Edelman Trust Barometer*: Edelman.
- Ehrlich, P. R. (1971). *The Population Bomb*. New York: Ballantine Book.
- EIRiS. (2010). EIRiS Experts in Responsible Investment Solutions. Retrieved January 10, 2010, from <http://www.eiris.org/>
- Ekins, P., Simon, S., Deutsch, L., Folke, C., & De Groot, R. (2003). A framework for the practical application of the concepts of critical natural capital and strong sustainability. *Ecological Economics*, 44(2-3), 165-185.
- Elijido-Ten, E. (2007). Applying Stakeholder Theory to Analyze Corporate Environmental Performance: Evidence from Australian Listed Companies. *Asian Review of Accounting*, 15(2), 164-184.
- Elkington, J. (1997). *Cannibals with forks: the triple bottom line of the 21st century business*. Oxford: Capstone.

- Elkington, J. (2004). Entre the Triple Bottom Line. In A. Henriques & J. Richardson (Eds.), *The Triple Bottom Line: Does it All Add Up? Assessing the Sustainability of Business and CSR* (pp. 1-16). London: Earthscan.
- Elkington, J. (2006). Governance for Sustainability. *Corporate Governance: An International Review*, 14(6), 522-529.
- Elzen, B., Geels, F. W., & Green, K. (2004). *System Innovation and Transition to Sustainability: Theory, Evidence and Policy*. Cheltenham/Northampton: Edward Elgar Publishing Limited.
- Emerson, J., Esty, D. C., Kim, C., Srebotnjak, T., Levy, M. A., Mara, V., et al. (2010). *2010 Environmental Performance Index*. New Haven: Yale Center for Environmental Law & Policy, Center for International Earth Science information Network, World Economic Forum, and Joint Research Centre of the European Commission.
- Environmental Law Institute. (2003). *Prior Informed Consent and Mining: Promoting the Sustainable Development of Local Communities*. Washington, DC: Environmental Law Institute.
- EPI. (2010). Environmental Performance Index 2010: Country scores. Retrieved January 10, 2010, from <http://epi.yale.edu/Countries>
- Ericsson, M. (2008). *Global Mining: New Actors!* Solna Raw Materials Group.
- Esteves, A. M. (2008). Evaluating community investments in the mining sector using multi-criteria decision analysis to integrate SIA with business planning. *Environmental Impact Assessment Review*, 28(4-5), 338-348.
- Evans, D., & Abrahamse, W. (2009). Beyond rhetoric: the possibilities of and for "sustainable lifestyles". *Environmental Politics*, 18(4), 486-502.
- Farrell, L., Sampat, P., Sarin, R., & Slack, K. (2004). *Dirty Metals: Mining, Communities and the Environment*. Washington and Boston: Earthworks and Oxfam America.
- FEE. (2002). *Providing Assurance on Sustainability Reports*. Brussels: Fédération des Experts Comptables Européens.
- FEE. (2006). *Key Issues in Sustainability Assurance - An Overview*. Brussels: Fédération des Experts Comptables Européens.
- Fiala, N. (2008). Measuring sustainability: Why the ecological footprint is bad economics and bad environmental science. *Ecological Economics*, 67(4), 519-525.
- Financial Times. (2009). The World's Largest Companies: FT Global 500 2009. Retrieved 27 August, 2009, from <http://www.ft.com/reports/ft500-2009>
- FOE. (2002). Statement to the UN Environment Program regarding the Mining, Minerals and Sustainable Development Initiative Retrieved 15.07.09, from <http://www.foei.org/en/campaigns/mining/mssd.html>
- Fonseca, A. (2008). *Can we trust the sustainability reports of the mining industry? A critical analysis of assurance statements in the 2007 reports of the ICMM's company members*. Paper presented at the 2nd International Sustainability Conference: Creating Values for Sustainable Development, 21-22 August 2008, Basel, Switzerland.
- Fonseca, A. (2010a). *Barriers to Strengthening the Global Reporting Initiative (GRI) Framework: exploring the perceptions of consultants, practitioners, and researchers*. Paper presented at the Accountability Through Measurement: 2nd National Canadian Sustainability Indicators Network Conference in Toronto.
- Fonseca, A. (2010b). How credible are mining corporations' sustainability reports? A critical analysis of external assurance under the requirements of the International Council on

- Mining and Metals. *Corporate Social Responsibility and Environmental Management*, 10 (in press).
- Fonseca, A., & Gibson, R. B. (2008). Application Denied: BC's Kemess North and Nova Scotia's Whites Point projects promised jobs and revenue, but the communities were looking for overall sustainability. *Alternatives Journal*, 34(4), 10-12.
- Forsgren, M. (2008). *Theories of the Multinational Firm: A Multidimensional Creature in the Global Economy*. Cheltenham, UK: Edward Elgar.
- Forum for the Future. (2010). The Five Capitals Model - a framework for sustainability. from <http://www.forumforthefuture.org/files/The%20five%20capitals%20model.pdf>
- Foster, P. (2010). Kill the Avatar Bill! *Financial Post* Wednesday, March 10, 2010. Retrieved 11.03.10, from <http://www.financialpost.com/opinion/columnists/story.html?id=8f73f0c8-ddd0-4e95-aa15-41c127a80b86>
- Fowler, S. J., & Hope, C. (2007). A Critical Review of Sustainable Business Indices and their Impact. *Journal of Business Ethics*, 76, 243-252.
- Frame, B., & Cavanagh, J. (2009). Experiences of sustainability assessment: An awkward adolescence. *Accounting Forum*, 33(3), 195-208.
- Francis, G. (2005). *Overview of Concepts and Insights From Complex Systems*. Waterloo: Department of Environment and Resource Studies, University of Waterloo.
- Franklin, D. (2008). Special Report on Corporate Social Responsibility. *The Economist*, 386(8563).
- Frazier, J. G. (1997). Sustainable development: modern elixir or sack dress? *Environmental Conservation*, 24(2), 182-193.
- Freeman, R. E. (1984). *Strategic Management: A Stakeholder Approach*. Boston, MA: Pitman.
- Freeman, R. E. (1999). Divergent Stakeholder Theory. *Academy of Management Review*, 24(2), 233-236.
- Freeman, R. E., & Velamuri, S. R. (2006). A New Approach to CSR: Company Stakeholder Responsibility. In A. Kakabadse & M. Mette (Eds.), *Corporate social responsibility: reconciling aspiration with application* (pp. 9-23). Houndmills: Pgrave Macmillan.
- Freeport-McMoRan. (2008). *A World of Commitments: Working Toward Sustainable Development: Freeport-McMoRan Copper & Gold Inc. 2007 Working Toward Sustainable Development Report*. Phoenix: Freeport-McMoRan Copper & Gold Inc.
- Friedman, M. (1970). The Social Responsibility of Business is to Increase its Profits. *The New York Times Magazine*, September 13.
- Friedman, M. (1982). *Capitalism and Freedom* (2 ed.). Chicago: Chicago University Press.
- FTSE. (2010). FTSE4GOOD Index Series. Retrieved January 10, 2010, from [http://www.ftse.com/Indices/FTSE4Good\\_Index\\_Series/index.jsp](http://www.ftse.com/Indices/FTSE4Good_Index_Series/index.jsp)
- Funtowicz, S. O., & Ravetz, J. R. (1993). Science for the post-normal age, *Futures* (Vol. 25, pp. 739-755): Elsevier Science.
- Futerra. (2008). *The Greenwash Guide*. London: Futerra Sustainability Communications.
- Garrett, N., & Mitchell, H. (2009). *Trading Conflict for Development: Utilising the Trade in Minerals from Eastern DR Congo for Development*. Resource Consulting Services.
- Garvin, T., McGee, T. K., Somyer-Tonic, K. E., & Aubynn, E. A. (2009). Community-company relations in gold mining in Ghana. *Journal of Environmental Management*, 90, 571-586.

- Gasparatos, A., El-Haram, M., & Horner, M. (2009). The argument against a reductionist approach for measuring sustainable development performance and the need for methodological pluralism. *Accounting Forum*, 33(3), 245-256.
- Gedicks, A. (1994). *The new resource wars: native and environmental struggles against multinational corporations*. Montreal: Black Rose Books.
- Gelb, A. H., & Associates. (1988). *Oil Windfalls: Blessing or Curse?* Washington: Oxford University Press and The World Bank.
- Gensch, C.-O., & Manhart, A. (2007). *Product Sustainability Assessment (PROSA) and Social Impacts of the Production of Notebook PCs: Methodological and Procedural Experiences*. Paper presented at the 3rd Canadian Forum on the Life Cycle Management of Products and Services.
- George, C., & Kirkpatrick, C. (2007). *Impact Assessment and Sustainable Development: European Practice and Experience*. Cheltenham: Edward Elgar.
- Geßner, C., Schulz, W. F., & Kreeb, M. (2001). What is a good strategy for sustainable development? A draft set of evaluation criteria. *Greener Management International*(36), 67-90.
- Gibson, R. B. (2002). From Wreck Cove to Voisey's Bay: the evolution of federal environmental assessment in Canada. *Impact Assessment and Project Appraisal*, 20(3), 151-159.
- Gibson, R. B. (2006). Sustainability assessment and conflict resolution: Reaching agreement to proceed with the Voisey's Bay nickel mine. *Journal of Cleaner Production*, 14(3-4), 334-348.
- Gibson, R. B., Hassan, S., Holtz, S., Tansey, J., & Whitelaw, G. (2005). *Sustainability Assessment: Criteria and Processes* London: Earthscan.
- Gillham, B. (2005). *Research Interviewing: the range of techniques*. Berkshire: Open University Press.
- Ginsberg, B. (2006). FRP: a tool for measuring and improving facility sustainability performance. (Presented at the National Environmental Partnership Summit): Ceres.
- Given, L. M. (2008). *The SAGE Encyclopedia of Qualitative Research Methods: Volumes 1 & 2*. Thousand Oaks: SAGE Publications.
- Gladwin, T. N., Kennelly, J. J., & Krause, T.-S. (1995). Shifting Paradigms for Sustainable Development: Implications for Management Theory and Research. *Academy of Management Review*, 20(4), 874-907.
- Glaser, B. G. (2002). Constructivist Grounded Theory? *Forum: Qualitative Social Research*, 3(3), <http://www.qualitative-research.net/index.php/fqs/article/view/825>.
- Glaser, B. G. (2009). Jargonizing: the use of the grounded theory vocabulary. *The Grounded Theory Review*, 8(1), <http://www.groundedtheory.com/booksjournals.aspx>.
- Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: strategies for qualitative research*. Chicago: Aldine Pub. Co.
- Global Witness. (2010). Campaigns. Retrieved January 20, 2010, from [http://www.globalwitness.org/media\\_library.php](http://www.globalwitness.org/media_library.php)
- GMI. (2010). GovernanceMetrics International: Pioneering Accountability Ratings. Retrieved January 10, 2010, from <http://www.gmiratings.com/>
- Gold Fields. (2007). *Securing the Future*. Johannesburg: Gold Fields.
- Goldsmith, E., Allen, R., Allaby, M., Davoll, J., & Lawrence, S. (1972). A Blueprint for Survival. *The Ecologist*, 2(1).

- Google. (2009). Sustainable development - google search. Retrieved August 12, 2009, from [http://www.google.ca/search?q=sustainable+development&hl=en&tbo=1&ei=djmDSrCFEprfmQer8dmhDQ&sa=X&oi=timeline\\_other\\_dates&ct=timeline-other-dates&tbs=tl:1,tlul:1950,tluh:2009](http://www.google.ca/search?q=sustainable+development&hl=en&tbo=1&ei=djmDSrCFEprfmQer8dmhDQ&sa=X&oi=timeline_other_dates&ct=timeline-other-dates&tbs=tl:1,tlul:1950,tluh:2009)
- Gray, R. (1996). Corporate Reporting for Sustainable Development: Accounting for Sustainability AD2000. In R. Welford & R. Starkey (Eds.), *Business and the Environment*. Washington: Earthscan Publications Limited.
- Gray, R. (2005). *Does sustainability reporting improve corporate behaviour? Wrong question? Right time?* Paper presented at the ICAEW Information for Better Markets. Retrieved from [http://www.ems.servecast.com/pe\\_storage/icaew/Presentations/TSD/Does%20sustainability%20reporting%20improve%20corporate%20behaviour/default.asp](http://www.ems.servecast.com/pe_storage/icaew/Presentations/TSD/Does%20sustainability%20reporting%20improve%20corporate%20behaviour/default.asp)
- Gray, R. (2010). Is accounting for sustainability actually accounting for sustainability... and how would we know? An exploration of narratives of organisations and the planet. *Accounting, Organizations and Society*, 35, 47-62.
- Gray, R., & Bebbington, J. (2000). Environmental accounting, managerialism and sustainability: is the planet safe in the hands of business and accounting? In B. Jaggi & M. Freedman (Eds.), *Advances in Environmental Accounting and Management* (pp. 1-44): Emerald Publishing Limited.
- Gray, R., & Bebbington, J. (2007). Corporate sustainability: accountability or impossible dream? In G. Arkinson, S. Dietz & E. Neumayer (Eds.), *Handbook of Sustainable Development* (pp. 376-391). Cheltenham, Northampton: Edward Elgar.
- Gray, R., Kouhy, R., & Lavers, S. (1995). Corporate social and environmental reporting: A review of the literature and a longitudinal study of UK disclosure. *Accounting, Auditing & Accountability Journal*, 8(2), 47-77.
- Gray, R., & Milne, M. (2005). Towards Reporting on the Triple Bottom Line: Mirages, Methods and Myths. In A. Henriques & J. Richardson (Eds.), *The Triple Bottom Line: Does it All Add Up?* (pp. 70-80). London: Earthscan.
- Gray, R., & Milne, M. J. (2002). Sustainability Reporting: Who's Kidding Whom? *Chartered Accountants Journal of New Zealand* 81(6), 66-70.
- Gray, R., & Milne, M. J. (2005). Towards Reporting on the Triple Bottom Line: Mirages, Methods and Myths. In A. Henriques & J. Richardson (Eds.), *The Triple Bottom Line: Does it All Add Up?* (pp. 70-80). London: Earthscan.
- Gray, R., Owen, D., & Adams, C. (1996). *Accounting and accountability: changes and challenges in corporate social and environmental reporting*. London: Prentice Hall Europe.
- Greenpeace. (2010). Stop the tar sands. Retrieved January 20, 2010, from <http://www.greenpeace.org/canada/en/campaigns/tarsands>
- Greenwood, M. R. (2001). Community as a Stakeholder: Focusing on Corporate Social and Environmental Reporting. *Journal of Corporate Citizenship*, 4, 31-45.
- GRI. (2002). *Sustainability Reporting Guidelines*. Boston: Global Reporting Initiative.
- GRI. (2005). *GRI Boundary Protocol*. Amsterdam: Global Reporting Initiative.
- GRI. (2006a). *GRI Application Levels*. Amsterdam: Global Reporting Initiative.
- GRI. (2006b). *Sustainability Reporting Guidelines*. Amsterdam: Global Reporting Initiative.
- GRI. (2007). *Sustainability Reporting 10 Years On*. Amsterdam: Global Reporting Initiative (GRI).

- GRI. (2008a). BBC World Debate: How Accountable is business? Retrieved October 24, 2009, from <http://www.globalreporting.org/NewsEventsPress/LatestNews/2008/GRINewsMay2008BBC.htm>
- GRI. (2008b). *Reporting on Community Impacts: A survey conducted by the Global Reporting Initiative, the University of Hong Kong and CSR Asia*. Amsterdam: Global Reporting Initiative.
- GRI. (2009a). GRI Portal - Current Priorities. Retrieved September 25, 2009, from <http://www.globalreporting.org/CurrentPriorities/>
- GRI. (2009b). GRI Portal - Governance Bodies. Retrieved September 25, 2009, from <http://www.globalreporting.org/AboutGRI/WhoWeAre/GovernanceBodies/GovernanceBodiesLandingPage.htm>
- GRI. (2009c). GRI Portal - GRI Reports List. Retrieved September 25, 2009, from <http://www.globalreporting.org/GRIReports/GRIReportsList>
- GRI. (2009d). GRI Portal - Organizational Stakeholders. Retrieved September 25, 2009, from <http://www.globalreporting.org/AboutGRI/WhoWeAre/OrganizationalStakeholders/>
- GRI. (2009e). GRI Portal - The Amsterdam Declaration on Transparency and Reporting. Retrieved November 25, 2009, from <http://www.globalreporting.org/currentpriorities/amsterdamdeclaration>
- GRI. (2010a). GRI Portal - GRI Reports List. Retrieved January 20, 2010, from <http://www.globalreporting.org/GRIReports/GRIReportsList>
- GRI. (2010b). GRI Portal: Current Priorities. Retrieved January 10, 2010, from <http://www.globalreporting.org/CurrentPriorities/>
- GRI. (2010c). GRI Reporting in the Mining & Metals Sector in 2009. Retrieved March 08, 2010, from <http://www.globalreporting.org/NR/rdonlyres/E75BAED5-F176-477E-A78E-DC2E434E1FB2/3937/GRIReportingintheMiningMetalsSectorin2009.pdf>
- GRI. (2010d). *Sustainability Reporting Guidelines & Mining and Metals Sector Supplement*. Amsterdam: Global Reporting Initiative.
- Grießhammer, R., Buchert, M., Gensch, C.-O., Hochfeld, C., Manhart, A., Reisch, L., et al. (2007). *PROSA - Product Sustainability Assessment*. Freiburg: Öko-Institut e.V. – Institute for Applied Ecology.
- Griffiths, D. (1997). The Case for Theoretical Pluralism. *Educational Management & Administration*, 25(4), 371-380.
- Guenther, E., Hoppe, H., & Poser, C. (2006). Environmental Corporate Social Responsibility of Firms in the Mining and Oil and Gas Industries: Current Status Quo of Reporting Following GRI Guidelines. *Greener Management International*, 53, 7-25.
- Guggenheim, D. (Director). (2006). *An Inconvenient Truth*. United States: Paramount Classics.
- Gunderson, L. H., & Holling, C. S. (2002). *Panarchy: understanding transformations in human and natural systems*. Washington: Island Press.
- Gutés, M. C. (1996). The concept of weak sustainability. *Ecological Economics*, 17(3), 147-156.
- Guthrie, J., & Parker, L. D. (1989). Corporate social reporting: a rebuttal of legitimacy theory. *Accounting and Business Research*, 19(76), 343-352.
- Hacking, T., & Guthrie, P. (2008). A framework for clarifying the meaning of Triple Bottom-Line Integrated, and Sustainability Assessment. *Environmental Impact Assessment Review*, 28, 73-89.

- Hák, T., Moldan, B., & Dahl, A. L. (2007). *Sustainability Indicators: A Scientific Assessment*. Washington: Island Press.
- Hamilton, K., & Atkinson, G. (2006). *Wealth, Welfare and Sustainability*. Cheltenham, Northampton: Edward Elgar.
- Hardi, P., & Zdan, T. (1997). *Assessing Sustainable Development: Principles in Practice*. Winnipeg: International Institute for Sustainable Development.
- Hardin, G. (1968). The Tragedy of the Commons: The population problem has no technical solution; it requires a fundamental extension in morality. *Science*, 62, 1243-1248.
- Harding, R. (1998). *Environmental decision-making: the role of scientists, engineers and the public*. Leichhardt, NSW: Federation Press.
- Harger, J. R. E., & Meyer, F. M. (1996). Definition of indicators for environmentally sustainable development. *Chemosphere*, 33(9), 1749-1775.
- Hargroves, K. C., & Smith, M. H. (2005). *The natural advantage of nations: business opportunities, innovation, and governance in the 21st century*. London: Earthscan.
- Hart, C. (1998). *Doing a literature review: releasing the social science imagination*. London: SAGE Publications.
- Hart, D., Anghel, A. T., & Vuille, J. H. F. (2009). A quasi-Delphi study on technological barriers to the uptake of hydrogen as a fuel for transport applications - Production, storage and fuel cell drivetrain considerations. *Journal of Power Sources*, 193, 298-307.
- Hart, S. L. (1997). Beyond Greening: Strategies for a Sustainable World. *Harvard Business Review*, Jan 1, 66-76.
- Hart, S. L. (2005). *Capitalism at the crossroads: the unlimited business opportunities in solving the world's most difficult problems*. Upper Saddle River: Wharton School.
- Hartwick, J. M. (1977). Intergenerational Equity and the Investing of Rents from Exhaustible Resources. *The American Economic Review*, 67(5), 972-974.
- Hawken, P. (1993). *The Ecology of Commerce*. New York: HarperCollins.
- Hawken, P., Lovins, A., & Lovins, L. H. (1999). *Natural Capitalism: creating the next industrial revolution*. Boston, London: Little, Brown and Company.
- Hay, P. R. (2002). *Main currents in western environmental thought*. Bloomington: Indiana University Press.
- Hayes, K., & Burge, R. (2003). *Coltan Mining in the Democratic Republic of Congo: How tantalum-using industries can commit to the reconstruction of the DRC*. Cambridge, UK: Fauna & Flora International.
- Hedberg, C., Johan, & von Malmborg, F. (2003). The Global Reporting Initiative and corporate sustainability reporting in Swedish companies. *Corporate Social Responsibility and Environmental Management*, 10 (3), 153 - 164.
- Hediger, W. (2007). *Framing corporate social responsibility and contribution to sustainable development*. Paper presented at the SSES Annual Meeting: Finance and Financial Econometrics, March 22-23, 2007.
- Henkel, C. (Director). (1999). *Walking Through a Minefield*. Australia.
- Henriques, A. (2007). *Corporate Truth: The Limits to Transparency*. London: Earthscan.
- Henriques, A., & Richardson, J. (2004). *The Triple Bottom Line: Does it All Add Up?* London: Earthscan.
- Henstock, M. E. (1996). *The Recycling of Non-Ferrous Metals*. Ottawa: The International Council on Metals and the Environment.



- Hentschel, T., Hruschka, F., & Priester, M. (2002). *Global Report on Artisanal & Small-Scale Mining*: IIED and WBCSD.
- Hills, J., & Welford, R. (2005). Profits, Pollution and Prison: A Study of Gold Mining in Indonesia. *Corporate Social Responsibility and Environmental Management*, 12(2), 105-113.
- Hills, J., & Welford, R. (2006). Case Study: Auditing for Human Rights: Freeport-McMoRan Copper and Gold in Papua. *Corporate Social Responsibility and Environmental Management*, 13, 108-114.
- Hilson, G., & Basu, A. J. (2003). Devising indicators of sustainable development for the mining and minerals industry: An analysis of critical background issues. *International Journal of Sustainable Development and World Ecology*, 10(4), 319-331.
- Hilson, G., & Haselip, J. (2004). The environmental and socioeconomic performance of multinational mining companies in the developing world economy. *Minerals & Energy - Raw Materials Report*, 19(3), 25 - 47.
- Hinde, C. (2000). The Global Mining Industry. *Industry and Environment: Special Issue on Mining and Sustainable Development II - challenges and perspectives*, 23, 10-15.
- Hitchcock, D., & Willard, M. (2006). *The Business Guide to Sustainability: Practical Strategies and Tools for Organizations*. London: Earthscan.
- Hitchcock, D., & Willard, M. (2008). *The Step-by-Step Guide to Sustainability Planning: How to Create and Implement Sustainability Plans in Any Business or Organization*. London: Earthscan.
- Hodge, A., Hardi, P., & Bell, D. V. J. (1999). *Seeing change through the lens of sustainability*. Paper presented at the Beyond Delusion: Science and Policy Dialogue on Designing Effective Indicators of Sustainable Development.
- Hodge, K., Subramaniam, N., & Stewart, J. (2009). Assurance of sustainability reports: Impact on report users' confidence and perceptions of information credibility. *Australian Accounting Review*, 19(3), 178-194.
- Hodge, R. A. (1997). Toward a conceptual framework for assessing progress toward sustainability. *Social Indicators Research*, 40, 5-98.
- Holling, C. S. (1973). Resilience and Stability of Ecological Systems. *Annual Review of Ecology and Systematics*, 4, 1-23.
- Holling, C. S. (1978). *Adaptive Environmental Assessment and Management*. New York: Wiley.
- Holling, C. S. (1995). *Barriers and Bridges to the Renewal of Ecosystems and Institutions*. New York: Columbia University Press.
- Holling, C. S. (2001). Understanding the Complexity of Economic, Ecological, and Social Systems. *Ecosystems*, 4, 390-405.
- Holme, R., & Watts, P. (2000). *Corporate Social Responsibility: making good business sense*. Tockwith: World Business Council for Sustainable Development (WBCSD).
- Homer-Dixon, T. (2006). *The upside of down: catastrophe, creativity, and the renewal of civilization*. Washington: Island Press.
- Horiuchi, R., Chuchard, R., Shea, L., & Townsend, S. (2009). *Understanding and Preventing Greenwash: A Business Guide*. London: BSR and Futerra.
- Horkheimer, M. (1975). Traditional and Critical Theory. In M. Horkheimer (Ed.), *Critical theory: selected essays* (pp. 188-243). New York: Continuum.

- Hotelling, H. (1931). The Economics of Exhaustible Resources. *The Journal of Political Economy*, 39(2), 137-175.
- Hughes, J. D. (1996). *Pan's Travail: Environmental Problems of the Ancient Greeks and Romans*. Baltimore: Johns Hopkins University Press.
- Humphreys, D. (2001). Sustainable development: can the mining industry afford it? *Resources Policy*, 27, 1-7.
- Humphreys, M., Sachs, J. D., & Stiglitz, J. E. (2007). *Escaping the Resource Curse*. New York: Columbia University Press.
- Hutchison, A. J., Johnston, L. H., & Breckon, J. D. (2009). Using QSR-NVivo to facilitate the development of a grounded theory project: an account of a worked example. *International Journal of Social Research Methodology*(Online Issue), 1-20.
- ICMM. (2004). *Dirty Metals - ICMM Response*. London: International Council on Mining and Metals.
- ICMM. (2006). *Maximizing value: guidance on implementing materials stewardship in the minerals and metals value chain*. London: International Council on Mining and Metals.
- ICMM. (2007). *Materials Stewardship: Eco-efficiency and Product Policy*. London: International Council on Mining and Metals.
- ICMM. (2008a). *ICMM Response to the 2008 No Dirty Gold Report Golden Rules: Making the case for responsible mining*. London: International Council on Mining and Metals.
- ICMM. (2008b). *ICMM Sustainable Development Framework: Assurance Procedure*. London: International Council on Mining and Metals.
- ICMM. (2010a). ICMM About us. Retrieved January 20, 2010, from <http://www.icmm.com/about-us>
- ICMM. (2010b). ICMM Member companies. Retrieved February 10, 2010, from <http://www.icmm.com/members/member-companies>
- ICMM. (2010c). ICMM Our Work: Sustainable Development Framework. Retrieved January 10, 2010, from <http://www.icmm.com/our-work/sustainable-development-framework>
- ICMM. (2010d). *Making a Difference: Annual Review 2009*. London: International Council on Mining and Metals.
- IFAC. (2004). *ISAE 3000 - International Standard on Assurance Engagements. Assurance engagements other than audits or reviews of historical financial information*. New York: International Federation of Accountants.
- IFAC. (2008). *Handbook of International Auditing, Assurance, and Ethics Pronouncements: 2008 Edition*. New York: International Federation of Accountants.
- IFC. (2007). *Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets*. Washington: International Finance Corporation.
- IFC and GRI. (2009). *Embedding Gender in Sustainability Reporting: A Practitioner's Guide*. Amsterdam and Washington: International Finance Corporation and Global Reporting Initiative.
- IIED. (2008). *The Sustainable Commodity Initiative*. Winnipeg: International Institute for Sustainable Development.
- IISD. (2004). Compendium: A global directory to indicator initiatives - Global Reporting Initiative Details. Retrieved September 20, 2009, from <http://www.iisd.org/measure/compendium/DisplayInitiative.aspx?id=1608>
- IISD. (2009). Compendium: A Global Directory to Indicator Initiatives. Retrieved November 28, 2009, from <http://www.iisd.org/measure/compendium/>

- IISD and OECD. (2010). *BellagioSTAMP: SusTainability Assessment and Measurement Principles*. Winnipeg: International Institute for Sustainable Development and Organisation for Economic Co-operation and Development.
- IPCC. (2007). *Climate Change 2007: Synthesis Report (Fourth Assessment Report - AR4)*: Intergovernmental Panel on Climate Change.
- IRCA. (2009). IRCA, Certification Programmes: Sustainability Assurance Practitioner. Retrieved September 25, 2009, from [http://www.irca.org/certification/certification\\_11.html](http://www.irca.org/certification/certification_11.html)
- IRMA. (2009). The Initiative for Responsible Mining Assurance. Retrieved 15 July 2009, from <http://responsiblemining.net/>
- Isaksson, R., & Steimle, U. (2009). What does GRI-reporting tell us about corporate sustainability? *The TQM Journal*, 21(2), 168-181.
- Isenmann, R., Bey, C., & Welter, M. (2007). Online reporting for sustainability issues. *Business Strategy and the Environment*, 16(7), 487-501.
- Isenmann, R., Gómez, J. M., & Súpke, D. (2009). *Open the Window for Interactivity - Sustainability Reporting Powered through Web 2.0 Technologies*. Paper presented at the Environmental Accounting and Sustainable Development Indicators, Prague.
- IUCN. (1980). *World Conservation Strategy: Living Resource Conservation for Sustainable Development*. Gland: International Union of Conservation of Nature and Natural Resources.
- Jackson, M. C. (2003). *Systems Thinking: Creative Holism for Managers*. West Sussex: John Wiley & Sons.
- Janda, R. (2009). *Bill C-300: Sound and Measured Reinforcement for CSR*. Montreal: McGill University.
- Jantzi Sustainability. (2010). Jantzi-Sustainability: A Global Leader in Sustainability Analysis. Retrieved January 10, 2010, from <http://www.jantziresearch.com/>
- Jenkins, H. (2004). Corporate social responsibility and the mining industry: conflicts and constructs. *Corporate Social Responsibility and Environmental Management*, 11(1), 23 - 34.
- Jenkins, H., & Yakovleva, N. (2006). Corporate social responsibility in the mining industry: Exploring trends in social and environmental disclosure. *Journal of Cleaner Production*, 14(3-4), 271-284.
- Jones, D. (Director). (2009). Moon. UK.
- Jones, T. M., & Wicks, A. C. (1999). Convergent Stakeholder Theory. *Academy of Management Review*, 24(2), 206-221.
- Joyce, S., & Thomson, I. (2010). Earning a Social Licence to Operate: Social Acceptability and Resource Development in Latin America. Retrieved January 10, 2010, from <http://www.oncommonground.ca/publications/license.htm>
- Julien, H. (2008). Content Analysis. In L. M. Given (Ed.), *The SAGE Encyclopedia of Qualitative Research Methods: Volumes 1 & 2* (pp. 120-122). Thousand Oaks: SAGE Publications.
- Kalof, L., Dan, A., & Dietz, T. (2008). *Essentials of Social Research*. New York: Open University Press.
- Kamp-Roelands, N. (2002). *Towards a Framework for Auditing Environmental Reports*. Tilburg University, Tilburg, The Netherlands.

- Kan, M., & Parry, K. (2004). Identifying paradox: A grounded theory of leadership in overcoming resistance to change. *The Leadership Quarterly*, 15(4), 467-491.
- Kaptein, M., & Wempe, J. (2002). *The Balanced Company: A Theory of Corporate Integrity*. Oxford: Oxford University Press.
- Kay, J. J., Regier, H. A., Boyle, M., & Francis, G. (1999). An ecosystem approach for sustainability. *Futures*, 31, 721-742.
- Kay, J. J., & Schneider, E. (1994). Embracing complexity: The challenge of the ecosystem approach. *Alternatives Journal*, 20(3), 32.
- Kay, P. A. (2000). Measuring sustainability in Israel's water system. *Water International*, 25(4), 617-623.
- King, S., & Pushchak, R. (2008). Incorporating cumulative effects into environmental assessments of mariculture: Limitations and failures of current siting methods. *Environmental Impact Assessment Review*, 28(8), 572-586.
- Kirk, S. J. (1979). Life Cycle Costing: Problem Solver for Engineers. *Specifying Engineer*, 41(6), 123-129.
- Kitzes, J., Galli, A., Bagliani, M., Barrett, J., Dige, G., Ede, S., et al. (2009). A research agenda for improving national Ecological Footprint accounts. *Ecological Economics*, 68(7), 1991-2007.
- Klassen, R. D., & Whybark, D. C. (1994). Barriers to the management of international operations. *Journal of Operations Management*, 11(4), 385-396.
- KLD. (2010). FTSE KLD 400 Social Index. Retrieved January 10, 2010, from <http://www.kld.com/indexes/ds400index/index.html>
- Kloepffer, W. (2008). Life Cycle Sustainability Assessment of Products. *The International Journal of Life Cycle Assessment*, 13(2), 89-95.
- Kocsis, T. (Director). (2004). New Eldorado. Hungary.
- Koestler, A. (1967). *The Ghost in the Machine*. London: Macmillan.
- Kolk, A., & Perego, P. (2009). Determinants of the adoption of sustainability assurance statements: an international investigation. *Business Strategy and the Environment*, (online).
- KPMG. (2003). *Mining: a survey of global reporting trends*: KPMG.
- KPMG. (2006a). Better assurance starts with better understanding: how KPMG sees assurance on sustainability reports (pp. 32). Amsterdam: KPMG Corporate Sustainability Services.
- KPMG. (2006b). *Global Mining Reporting Survey 2006*: KPMG.
- KPMG. (2008). *KPMG International Survey of Corporate Responsibility Reporting 2008*. Amstelveen: KPMG Sustainability Services.
- Krautkraemer, J. A. (2005). *Economics of Natural Resource Scarcity: The State of the Debate*. Washington: Resources for the Future.
- Krick, T., Forstater, M., Monaghan, P., & Sillanpää, M. (2005). *The Stakeholder Engagement Manual: Volume 2: The Practitioner's Handbook on Stakeholder Engagement*: AccountAbility, the United Nations Environment Programme, and Stakeholder Research Associates.
- Laine, M. (2005). Meanings of the term "sustainable development" in Finnish corporate disclosures. *Accounting Forum*, 29, 395-413.
- Lakoff, G., & Johnsen, M. (2003). *Metaphors we live by*. London: The University of Chicago Press.

- Lansen-Rogers, J., & Oelschlaegel, J. (2005). *Assurance Standards Briefing: AA1000 Assurance Standard & ISAE3000*. London/Amsterdam: AccountAbility/KPMG.
- Lantos, G. P. (2001). The boundaries of strategic corporate social responsibility. *The Journal of Consumer Marketing*, 18(7), 595-630.
- Laufer, W. S. (2003). Social Accountability and Corporate Greenwashing. *Journal of Business Ethics*, 43(3), 253-261.
- Lawn, P. (2006). *Sustainable Development Indicators in Ecological Economics*. Cheltenham, UK: Edward Elgar.
- Layder, D. (2006). *Understanding Social Theory*. London: SAGE Publications.
- Lei, M., Qi-yan, F., Lai, Z., Ping, L., & Qing-jun, M. (2009). Environmental cumulative effects of coal underground mining. *Procedia Earth and Planetary Science*, 1, 1280-1284.
- Lenzen, M., Dey, C. J., & Murray, S. A. (2004). Historical accountability and cumulative impacts: the treatment of time in corporate sustainability reporting. *Ecological Economics*, 51, 237-250.
- Lindblom, C. K. (1994). *The Implications of organizational legitimacy for corporate social performance and disclosure*. Paper presented at the Critical Perspectives on Accounting Conference, New York.
- Locke, K. D. (2001). *Grounded Theory in Management Research*. London: SAGE Publications.
- Lockyer, S. (2008). History of Qualitative Research. In L. M. Given (Ed.), *The SAGE Encyclopedia of Qualitative Research Methods: Volumes 1 & 2* (pp. 706-711). Thousand Oaks: SAGE Publications.
- Löf, O. (2009a). Mining visuals: how times have changed. *Mining Journal*, October 2, 24-25.
- Löf, O. (2009b). A Visualisation of the Mining Industry: An Analysis of the Visual Aspects of Annual Reports from Global Mining Companies. *LME Weekly Supplement*, October, 36-38.
- Lomborg, B. (2001). *The Skeptical Environmentalist: Measuring the Real State of the World*. New York: Cambridge University Press.
- Lonmin. (2007). *Lonmin Plc Sustainable Development Report: Building Value*. London: Lonmin Plc.
- Looker, S. (Director). (2008). *Historical Disaster: Black Christmans*. UK.
- Lorenz, E. (1993). *The Essence of Chaos*. Seattle: University of Washington Press.
- Lozano, R., & Huisingh, D. (2010). Inter-linking issues and dimensions in sustainability reporting. *Journal of Cleaner Production*, (in press).
- Macdonald, I., & Rowland, C. (2002). *Tunnel Vision: Women, Mining and Communities. An Anthology*. Victoria, Australia: Oxfam Community Aid Abroad.
- Macintyre, M. (2007). Informed Consent and Mining Projects: A View from Papua New Guinea. *Pacific Affairs*, 80(1), 49-65.
- MacLean, R., & Rebernak, K. (2007). Closing the credibility gap: The challenges of corporate responsibility reporting. *Environmental Quality Management*, 16(4), 1 - 6.
- Mainzer, K. (2007). *Thinking in Complexity* (5 th ed.). Berlin: Springer.
- Markusen, J. R. (2002). *Multinational Firms and the Theory of International Trade*. Cambridge, MA: MIT Press.
- Marrewijk, M. v. (2003). Concepts and Definitions of CSR and Corporate Sustainability: Between Agency and Communion. *Journal of Business Ethics*, 44, 95-105.

- Marrewijk, M. v., & Hardjono, T. W. (2003). European Corporate Sustainability Framework for Managing Complexity and Corporate Transformation. *Journal of Business Ethics*, 44, 121-132.
- Marrewijk, M. v., & Werre, M. (2003). Multiple Levels of Corporate Sustainability. *Journal of Business Ethics*, 44, 107-119.
- Martin, S. (2007). *Free, prior and informed consent: The role of mining companies*. Victoria, Australia: Oxafam Australia.
- Mathews, M. R. (1997). Twenty-five years of social and environmental accounting research. *Accounting, Auditing & Accountability Journal*, 10(4), 481 - 531.
- Matthews, M., Pearce, R., & Chapman, J. (2004). *Sustainability Reporting by the Mining Industry Compared with the Requirements of the GRI*. Paper presented at the Minerals Council of Australia 2004 Inaugural Sustainable Development Conference.
- Maxwell, J. A., & Mittapalli, K. (2008). Theory. In L. M. Given (Ed.), *The SAGE Encyclopedia of Qualitative Research Methods: Volumes 1 & 2* (pp. 876-879). Thousand Oaks: SAGE Publications.
- MCA. (2005). *Enduring Value: The Australian Minerals Industry Framework for Sustainable Development*. Kingston: Minerals Council of Australia.
- MCA. (2010). Minerals Council of Australia: What is Enduring Value? Retrieved January 10, 2010, from [http://www.minerals.org.au/enduringvalue/enduring\\_value/index.html](http://www.minerals.org.au/enduringvalue/enduring_value/index.html)
- McAller, P., & McElhinney, A. (Director). (2006). *Mine Your Own Business: The Dark Side of Environmentalism*. UK.
- McAllister, M. L., & Alexander, C. J. (1997). *A stake in the future: redefining the Canadian mineral industry*. Vancouver: University of British Columbia Press.
- McAllister, M. L., Scoble, M., & Veiga, M. (1999). Sustainability and the Canadian mining industry at home and abroad. *CIM Bulletin*, 92(1033), 85-92.
- McCarthy, D. D. P. (2006). *A Critical Systems Approach to Socio-Ecological Systems: Implications for social learning and governance*. University of Waterloo, Waterloo.
- McCool, S. F., & Stankey, G. H. (2004). Indicators of Sustainability: Challenges and Opportunities at the Interface of Science and Policy. *Environmental Management*, 33(3), 294-305.
- McCormick, J. (1986). The Origins of the World Conservation Strategy. *Environmental Review*, 10(3).
- McDonough, W., & Braungart, M. (2002). *Cradle to cradle : remaking the way we make things*. New York: North Point Press.
- McElroy, M. W. (2008). Corporate Sustainability Reporting - Where's the Context? Retrieved September 10, 2009, from [http://www.sustainablelifemedia.com/content/column/strategy/corporate\\_sustainability\\_reporting\\_wheres\\_the\\_context](http://www.sustainablelifemedia.com/content/column/strategy/corporate_sustainability_reporting_wheres_the_context)
- McElroy, M. W., Jorna, R. J., & Engelen, J. v. (2008). Sustainability Quotients and the Social Footprint. *Corporate Social Responsibility and Environmental Management*, 15, 223-234.
- McIntosh, R. P. (1987). Pluralism in Ecology. *Annual Review of Ecology and Systematics*, 18, 321-341.
- McKelvey, V. (1972). Mineral resource estimates and public policy. *American Scientist*, 60, 32-40.

- MEA. (2005a). *Ecosystems and Human Well-being: A Framework for Assessment*. Washington, DC: Millennium Ecosystem Assessment Outreach and Engagement Office c/o World Resources Institute.
- MEA. (2005b). *Millennium Ecosystem Assessment: Ecosystems and Human Well-being - Synthesis*. Washington: Island Press.
- Meadows, D. H. (1998). *Indicators and Information Systems for Sustainable Development: A Report to the Balaton Group*. Hartland Four Corners: The Sustainability Institute.
- Meadows, D. H., & Meadows, D. L. (2007). The history and conclusions of the limits to growth. *System Dynamics Review*, 23(2-3), 191-197.
- Meadows, D. H., Meadows, D. L., & Randers, J. (1992). *Beyond the limits: confronting global collapse, envisioning a sustainable future*. Post Mills, VT: Chelsea Green Pub. Co.
- Meadows, D. H., Meadows, D. L., Randers, J., & III, W. W. B. (1972). *The Limits to growth: A Report for the Club of Rome's Project on the Predicament of Mankind*. New York: Universe Books.
- Meadows, D. H., Randers, J., & Meadows, D. (2004). *Limits to Growth: The 30 Year Update*. London: Earthscan.
- Miles, M. B., & Huerman, A. M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*. Thousand Oaks: SAGE Publications.
- Mills, J., Bonner, A., & Francis, K. (2006). The Development of Constructivist Grounded Theory. *International Journal of Qualitative Methods*, 5(1), [http://www.ualberta.ca/~iiqm/backissues/5\\_1/pdf/mills.pdf](http://www.ualberta.ca/~iiqm/backissues/5_1/pdf/mills.pdf).
- Milne, M. J., Ball, A., & Gray, R. (2005). *From soothing palliatives and towards ecological literacy: a critique of the triple bottom line - Working Paper*. Department of Accountancy and Business Law. Dunedin: University of Otago.
- Milne, M. J., & Gray, R. (2007). Future prospects for corporate sustainability reporting. In J. Unerman, J. Bebbington & B. O'Dwyer (Eds.), *Sustainability Accounting and Accountability*. London and New York: Routledge.
- Milne, M. J., Kearins, K., & Walton, S. (2006). Creating Adventures in Wonderland: The Journey Metaphor and Environmental Sustainability. *Organization*, 13(6), 801-839.
- Milne, M. J., Tredidga, H., & Walton, S. (2005). *Playing with Magic Lanterns: The New Zealand Business Council for Sustainable Development and Corporate Triple Bottom Line Reporting, Working Paper*. Dunedin: Department of Accountancy and Business Law, University of Otago.
- Milne, M. J., Tregidga, H., & Walton, S. (2009). Words not actions! The ideological role of sustainable development reporting. *Accounting, Auditing & Accountability Journal*, 22(8), 1211-1257.
- Mineral Footprint. (2010). About us: Mineral Footprint (tm) Initiative. Retrieved January 10, 2010, from <http://mineralfootprint.net/>
- Mineral Information Institute. (2006). The American Lifestyle. Retrieved October 26, 2009, from <http://www.mii.org/pdfs/Minerals1776vsToday.pdf>
- Mines and Communities. (2008). The London Declaration 2008. Retrieved January 20, 2010, from <http://www.minesandcommunities.org/LondonDeclaration>
- Mining Association of Canada. (2009). *Towards Sustainable Mining: Progress Report 2009*. Ottawa: Mining Association of Canada.
- MiningWatch Canada. (2009). Bill C-300 - Corporate Accountability for the Activities of Mining, Oil or Gas Corporations in Developing Countries. Retrieved January 10,

- 2010, from <http://www.miningwatch.ca/en/bill-c-300-corporate-accountability-activities-mining-oil-or-gas-corporations-developing-countries>
- Mitchell, G. (1996). Problems and Fundamentals of Sustainable Development Indicators. *Sustainable Development*, 4, 1-11.
- Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a Theory of Stakeholder Identification and Salience: Defining the Principle of Who and What Really Counts. *Academy of Management Executive*, 22(4), 853-886.
- Mitsubishi Materials. (2007). *Corporate Social Responsibility Report: For People, Society and the Earth*. Tokyo: Mitsubishi Materials Corporation.
- MMSD. (2002). *Breaking New Ground: The Report of the Mining, Minerals and Sustainable Development Project (MMSD)*. London: Earthscan.
- Mock, T. J., Strohm, C., & Swartz, K. M. (2007). An examination of worldwide assured sustainability reporting. *Australian Accounting Review*, 17(1), 67-77.
- Moneva, J. M., Archel, P., & Correa, C. (2006). GRI and the camouflaging of corporate unsustainability. *Accounting Forum*, 30(2), 121-137.
- Montiel, I. (2008). Corporate Social Responsibility and Corporate Sustainability: Separate Pasts, Common Futures. *Organization & Environment*, 21(3), 245-269.
- Moon, J. (2007). The contribution of corporate social responsibility to sustainable development. *Sustainable Development*, 15(5), 296 - 306.
- Morse, S., McNamara, M., Acholo, M., & Okwoli, B. (2001). Sustainability Indicators: The Problem of Integration. *Sustainable Development*, 9, 1-15.
- Mucchielli, J.-L., & Mayer, T. (2004). *Multinational Firms' Location and the new Economic Geography*. Cheltenham, UK: Edward Elgar.
- Mudd, G. M. (2007a). Global trends in gold mining: Towards quantifying environmental and resource sustainability? *Resources Policy*, 32, 42-56.
- Mudd, G. M. (2007b). *The Sustainability of Mining in Australia: Key Production Trends and Their Environmental Implications for the Future*. Melbourne: Department of Civil Engineering, Monash University and Mineral Policy Institute.
- Musee, N., & Lorenzen, L. (2007). *Assessing sustainability of gold mining operations using fuzzy logic methodology*, Cairns, QLD.
- Muula, A. S. (2007). How relevant is Bellagio statement of principles on social justice and influenza to Africa? *Croatian Medical Journal*, 48(5), 752-754.
- Naess, A. (1973). The Shallow and the Deep, Long-Range Ecology Movement: A Summary. *Inquiry*, 16, 95-100.
- Naess, A., & Sessions, G. (1984). Basic Principles of Deep Ecology. *Ecophilosophy*, 6, 3-7.
- Najam, A. (1999). World Business Council for Sustainable Development: The greening of Business or a Greenwash? In H. O. Bergesen, G. Parmann & Ø. B. Thommessen (Eds.), *Yearbook of International Co-operation on Environment and Development 1999/2000* (pp. 65-75). London: Earthcan.
- Nazari, M. (2009). Sustainability Reporting Using GRI: Lessons Learned. *Mining.com: a mine of information*, 2(5), 32-33.
- Nazari, M. (2010). Size Matters - at least for CSR/GRI Reporting in Mining Sector. Retrieved March 20, 2010, from <http://prizmablog.com/2010/03/04/size-matters-%E2%80%93-at-least-for-csrgri-reporting-in-mining-sector/>
- Neary, J. P., & Wijnbergen, S. v. (1986). *Natural Resources and the Macroeconomy*. Cambridge, MA: The MIT Press.



- Ness, B., Urbel-Piirsalu, E., Anderberg, S., & Olsson, L. (2007). Categorising tools for sustainability assessment. *Ecological Economics*, 60(3), 498-508.
- Neuendorf, K. A. (2002). *The Content Analysis Guidebook*. Thousand Oaks: Sage Publications.
- Neumayer, E. (2003). *Weak versus strong sustainability : exploring the limits of two opposing paradigms*. Cheltenham, UK: Edward Elgar.
- Neumayer, E. (2004). Does the "Resource Curse" hold for Growth in Genuine Income as Well?, *World Development* (Vol. 32, pp. 1627-1640): Elsevier Science.
- Newmont. (2007). Beyond the Mine. Retrieved 10 November 2007, from <http://www.beyondthemine.com/2006>
- Nickel, E. H. (1995). The Definition of a Mineral. *The Canadian Mineralogist*, 33, 689-690.
- Nikolaou, I. E., & Evangelinos, K. I. (2008). The opportunities and challenges for a general definition of corporate sustainability. *International Journal of Green Economics*, 2(4), 392-410.
- Nippon. (2007). *Sustainability Report 2007*. Tokyo: Nippon Mining Holdings, Inc.
- Nissani, M. (1997). Ten Cheers for Interdisciplinarity: The Case for Interdisciplinary Knowledge and Research. *The Social Science Journal*, 34(2), 201-216.
- No Dirty Gold. (2010). No Dirty Gold. Retrieved January 20, 2010, from <http://www.nodirtygold.org/>
- Norberg, J., & Cumming, G. S. (2008). *Complexity Theory for a Sustainable Future*. New York: Columbia University Press.
- NRC. (2004). *Materials count: the case for material flows analysis*. Washington: National Academies Press, National Research Council (NRC).
- NZBCSD. (2003). *Business Guide to a Sustainable Supply Chain: A Practical Guide*: New Zealand Business Council for Sustainable Development.
- O'Dwyer, B., & Owen, D. L. (2005). Assurance statement practice in environmental, social and sustainability reporting: a critical evaluation. *The British Accounting Review*, 37(2), 205-229.
- O'Dwyer, B., & Owen, D. L. (2007). Seeking Stakeholder-Centric Sustainability Assurance: An Examination of Recent Sustainability Assurance Practice. *Journal of Corporate Citizenship*, Spring(25), 77-94.
- OECD. (2001). *OECD Environmental Indicators: Towards Sustainable Developments*. Paris: Organization for Economic Co-operation and Development.
- OECD. (2004). *Using the pressure-state-response model to develop indicators of sustainability*. Paris: OECD.
- Orr, D. W. (1994). Twine in the Baler. *Conservation Biology*, 8(4), 931-933.
- Owen, D. L. (2007). Assurance practice in sustainability reporting. In J. Unerman, J. Bebbington & B. O'Dwyer (Eds.), *Sustainability Accounting and Accountability*. London and New York: Routledge.
- Owen, D. L., & O'Dwyer, B. (2004). *Assurance Statement Quality in Environmental, Social and Sustainability Reporting: A Critical Evaluation of Leading Edge Practice*. Nottingham: International Centre for Corporate Social Responsibility.
- Owens, J. (1997). Life cycle assessment. *Journal of Industrial Ecology*, 1(1), 37-49.
- PACT. (2008). Democratic Republic of Congo. *Pact* Retrieved Jun/03/2008, from [http://www.pactworld.org/cs/africa/democratic\\_republic\\_of\\_congo](http://www.pactworld.org/cs/africa/democratic_republic_of_congo)
- Palenberg, M., Reinicke, W., & Witte, J. M. (2006). *Trends in non-financial reporting*. Berlin: Global Public Policy Institute.

- Palys, T. (2008). Purposive Sampling. In L. M. Given (Ed.), *The SAGE Encyclopedia of Qualitative Research Methods: Volumes 1 & 2* (pp. 697-698). Thousand Oaks: SAGE Publications.
- Parker, L. D. (2005). Social and environmental accountability research: a view from the commentary box. *Accounting, Auditing & Accountability Journal*, 18(6), 842-860.
- Parr, A. (2009). *Hijacking Sustainability*. Cambridge, MA: The MIT Press.
- Partidário, M. d. R. (2003). *Strategic Environmental Assessment (SEA): current practices, future demands and capacity-building needs*. Lisbon: International Association of Impact Assessment.
- Partidário, M. d. R., & Clark, R. (2000). *Perspectives on strategic environmental assessment*. London: Boca Raton.
- Partridge, K., Jackson, C., Wheeler, D., & Zohar, A. (2005). *From Words to Action: The Stakeholder Engagement Manual - Volume 1 The Guide to Practitioners' Perspectives on Stakeholder Engagement*. Cobourg: AccountAbility, UNEP and Stakeholder Research Associates.
- Patten, D. M. (1991). Exposure, Legitimacy, and Social Disclosure. *Journal of Accounting and Public Policy*, 10(4), 297-308.
- PDCA. (2009). e3plus: A Framework for Responsible Exploration. Retrieved October 20, 2009, from <http://www.pdac.ca/e3plus/index.html>
- Pearce, D. (1993). *Blueprint 3: Measuring sustainable development*. London: Earthscan.
- Pearce, D. W., & Atkinson, G. D. (1993). Capital theory and the measurement of sustainable development: an indicator of "weak" sustainability. *Ecological Economics*, 8, 103-108.
- Peck, P., & Sinding, K. (2003). Environmental and social disclosure and data richness in the mining industry. *Business Strategy and the Environment*, 12(3), 131 - 146.
- Perez, F., & Sanchez, L. E. (2009). Assessing the Evolution of Sustainability Reporting in the Mining Sector. *Environmental Management*, 43, 949-961.
- Phillis, Y. A., & Andriantiatsaholainaina, L. A. (2001). Sustainability: an ill-defined concept and its assessment using fuzzy logic. *Ecological Economics*, 37(3), 435 - 456.
- Phillis, Y. A., & Kouikoglou, V. S. (2009). *Fuzzy Measurement of Sustainability*. New York: Nova Science Publishers.
- Pintér, L. (2009). *Sustainability Assessment and Measurement Principles*. Paper presented at the 3rd World Forum on Measuring the Progress of Societies.
- Piper, J. M. (2002). CEA and sustainable development: Evidence from UK case studies. *Environmental Impact Assessment Review*, 22(1), 17-36.
- Plummer, R., & Armitage, D. (2007). A resilience-based framework for evaluating adaptive co-management: Linking ecology, economics and society in a complex world. *Ecological Economics*, 61, 62-74.
- Plummer, R., & Armitage, D. R. (2007). Charting the New Territory of Adaptive Co-Management: A Delphi Study. *Ecology and Society*, 12(2).
- Pojasek, R. B. (2007). A Framework for Business Sustainability. *Environmental Quality Management*, 17(2), 81-88.
- Pope, J., Annandale, D., & Morrison-Saunders, A. (2004). Conceptualising sustainability assessment. *Environmental Impact Assessment Review*, 24, 595-616.
- Pope, J., Morrison-Saunders, A., & Annandale, D. (2005). Sustainability assessment: applying sustainability assessment models. *Impact Assessment and Project Appraisal*, 23(4), 293-302.

- Porritt, J. (2007). *Capitalism as if the World Matters*. London: Earthscan.
- Power, T. M. (2002). *Digging to Development? A Historical Look at Mining and Economic Development*. Boston: Oxfam America.
- PRI. (2010). "Avatar" in the Amazon. from <http://www.pri.org/arts-entertainment/movies/avatar-in-the-amazon1863.html>
- Princen, T. (2005). *The Logic of Sufficiency*. Cambridge, MA: MIT Press.
- PRLog. (2007). G8 encourage GRI reporting to promote development and support investors. Retrieved September 15, 2009, from <http://www.prlog.org/10019639-g8-encourage-gri-reporting-to-promote-development-and-support-investors.html>
- PWC. (2007a). *Financial Reporting in the Mining Industry*. Johannesburg: Price Waterhouse Coopers.
- PWC. (2007b). *The Right Combination: Corporate Responsibility reports: the role of assurance providers and stakeholder panels*: PricewaterhouseCoopers International Limited.
- RA. (2008). Key Concepts. Retrieved October 23, 2008, from <http://www.resalliance.org/564.php>
- Race, R. (2008). *Literature Reviews*. Thousand Oaks: SAGE Publications.
- Radetzki, M. (1992). Economic Development and the Timing of Mineral Exploitation. In J. E. Tilton (Ed.), *Mineral Wealth and economic development* (pp. 39-57). Washington: Resources for the Future.
- Radley Yeldar and GRI. (2009). Trends in online sustainability reporting. Retrieved January 20, 2010, from <http://www.sustainabilityreportingonline.com/contact/>
- Rapport, D., & Friend, A. (1979). *Towards a comprehensive framework for environmental statistics: a stress-response approach*. Ottawa: Statistics Canada.
- Rebitzer, G., Ekvall, T., Frischknecht, R., Hunkeler, D., Norris, G., Rydberg, T., et al. (2004). Life cycle assessment Part 1: Framework, goal and scope definition, inventory analysis, and applications. *Environ Int*, 30(5), 701-720.
- Regist, E. (2008). The Doomsayer: The environment is going to hell, and human life is doomed to only get worse, right? Wrong. Conventional wisdom meet Julian Simon, the Doomsayer. *Wired* Retrieved January 10, 2010, from [http://www.wired.com/wired/archive/5.02/ffsimon\\_pr.html](http://www.wired.com/wired/archive/5.02/ffsimon_pr.html)
- Resilience Alliance. (2007a). Assessing and managing resilience in social-ecological systems: a practitioners workbook. Retrieved January 10, 2010
- Resilience Alliance. (2007b). Assessing and managing resilience in social-ecological systems: Volume 2. Supplementary notes to the practitioners workbook. Retrieved January 10, 2010, from <http://www.resalliance.org/3871.php>
- Revenge, Á. (Director). (2005). *Sipakapa No Se Vende* (Sipakapa is not for sale). Guatemala.
- Richardson, J. (2004). Accounting for Sustainability: Measuring Quantities or Enhancing Qualities? In A. Henriques & J. Richardson (Eds.), *The Triple Bottom Line: Does it All Add Up?* London: Earthscan.
- Rio Tinto. (2007). *Rio Tinto 2006 Sustainability development review: Access to resources, people, land, capital*. London and Melbourne: Rio Tinto Limited and Rio Tinto Plc.
- Rio Tinto. (2010). GRI checklist. Retrieved January 20, 2010, from [http://www.riotinto.com/ourapproach/17212\\_gri\\_checklist.asp](http://www.riotinto.com/ourapproach/17212_gri_checklist.asp)

- Roberts, R. W. (1992). Determinants of Corporate Social Responsibility Disclosure: An Application of Stakeholder Theory. *Accounting, Organizations and Society*, 17(6), 595-612.
- Robertson, A. M., & Jack, C. (2006). *From HSEC data verification to sustainability assurance - an evolutionary process?* Paper presented at the SD06: Operating for enduring value.
- Robins, N. (2006). *The Corporation that Changed the World: How the East India Company Shaped the Modern Multinational*. London: Pluto Press.
- Robson, C. (2002). *Real World Research: A Resource for Social Scientists and Practitioner-Researchers* (2 ed.). Oxford: Blackwell Publishing.
- Rooney, N., McCann, K. S., & Noakes, D. L. G. (2007). *From Energetics to Ecosystems: The Dynamics and Structure of Ecological Systems*. Dordrecht: Springer.
- Rosenfeld, L. (Director). (Under development). Watershed. Canada.
- Ross, M. (2001). *Extractive Sector and the Poor*. Boston: Oxfam America.
- Rotheroe, D. (Director). (2000). The Coconut Revolution. UK.
- Russel, J. (2006). GRI conference - Gore's touch of glamour. Retrieved September 05, 2009, from <http://www.ethicalcorp.com/content.asp?ContentID=4602&ContTypeID=>
- Russell, S. L., & Thomson, I. (2009). Analysing the role of sustainable development indicators in accounting for and constructing a Sustainable Scotland. *Accounting Forum*, 33(3), 225-244.
- Sachs, J. D., & Warner, A. M. (1997). *Natural Resource Abundance and Economic Growth*. Cambridge, MA: Centre for International Development and Harvard Institute for International Development.
- Sachs, J. D., & Warner, A. M. (2001). Natural Resources and Economic Development. *European Economic Review*, 45, 827-838.
- Sadler, B., & Verheem, R. (1996). *Strategic environmental assessment: status, challenges, and future directions*. The Hague, Netherlands: Ministry of Housing, Spatial Planning and the Environment of the Netherlands.
- SAM. (2010). Sustainability Investing. Retrieved January 10, 2010, from <http://www.sam-group.com/html/main.cfm>
- Sanchez, L. (2008). *Assessing the evolution of sustainability reporting in the mining sector*. Paper presented at the IAIA08 The Art and Science of Impact Assessment, 28th Annual Conference of the International Association for Impact Assessment, 4-10 May 2008.
- Sarin, R. (2006). No dirty gold: consumer education and action for mining reform. *Journal of Cleaner Production*, 14, 305-306.
- Savitz, A. W., & Weber, K. (2006). *The Triple Bottom Line: How Today's Best-Run Companies Are Achieving Economic, Social, and Environmental Success - and How You Can Too*. San Francisco, CA: John Wiley & Sons, Inc.
- Schedler, A., Diamond, L., & Plattner, M. F. (1999). *The Self-Restraining State: Power and Accountability in New Democracies*. London: Lynne Rienner Publishers.
- Schertenleib, R. (2000). *The Bellagio Principles and a household centered approach in environmental sanitation*. Paper presented at the Ecological sanitation Symposium.
- Schmandt, J., Ward, C. H., & Hastings, M. (2000). *Sustainable Development: The Challenge of Transition*. New York: Cambridge University Press.
- Schmidheiny, S. (1992). *Changing course: a global business perspective on development and the environment*. Cambridge: MIT Press.
- Scott, M. B., & Lyman, S. M. (1968). Accounts. *American Sociological Review*, 33(1), 46-62.

- Serageldin, I. (1996). *Sustainability and the Wealth of Nations: First Steps in an Ongoing Journey*. Washington, DC: The World Bank.
- Sethi, S. P. (2005). Effectiveness of Industry-Based Codes in Serving Public Interest - The Case of International Council on Mining and Metals. *Transnational Corporations*, 14(3), 56-100.
- Sethi, S. P., & Emelianov, O. (2006). A failed strategy of using voluntary codes of conduct by the global mining industry. *Corporate Governance*, 226-238.
- SGS. (2008). Sustainability Report Assurance. Retrieved 15 July 2009, from [http://www.sgs.com/sustainability\\_report\\_assurance?serviceId=13443&lobId=5554](http://www.sgs.com/sustainability_report_assurance?serviceId=13443&lobId=5554)
- Sharma, S., & Starik, M. (2002). *Research in corporate sustainability : the evolving theory and practice of organizations in the natural environment*. Cheltenham, UK ; Northampton, MA: Edward Elgar.
- Sharma, S., Starik, M., & Husted, B. (2007). *Sustainability Mosaic: Crafting Long-Term Ecological and Societal Solutions*. Cheltenham: Edward Elgar.
- Sharman, J. (Director). (2006). The Curse of Copper. Canada.
- Sherer, D., & Attig, T. W. (1983). *Ethics and the environment*. Englewood Cliffs, NJ: Prentice-Hall.
- Simon, J. L. (1981). *The ultimate resource*. Princeton, NJ: Princeton University Press.
- Simon, J. L. (1996). *The ultimate resource 2*. Princeton, NJ: Princeton University Press.
- Singh, N. C. (1996). *Community adaptation and sustainable livelihoods: basic issues and principles*. Winnipeg: International Institute for Sustainable Development.
- Sinhaa, S., Bhattacharyab, R. N., & Banerjee, R. (2007). Surface iron ore mining in eastern India and local level sustainability. *Resources Policy*, 2, 57-68.
- Smith, A. (1937). *An Inquire Into the Nature and Causes of the Wealth of Nations*. New York: Modern Library.
- Smith, J. D. (2009). *Normative Theory and Business Ethics*. Langam: Rowman & Littlefield Publishers, Inc.
- Solow, R. M. (1974). Intergenerational Equity and Exhaustible Resources. *The Review of Economic Studies*, 41, 29-45.
- Spence, C., & Gray, R. (2007). *Social and environmental reporting and the business case*. London: The Association of Chartered Certified Accountants (ACCA).
- Spitz, K., & Trudinger, J. (2009). *Mining and the Environment: from Ore to Metal*. Boca Raton: CRC Press.
- Springett, D. (2003). Business conceptions of Sustainable Development: A Perspective From Critical Theory. *Business Strategy and the Environment*, 12, 71-86.
- Squires, N. (2008). Nauru seeks to regain lost fortunes. *BBC NEWS, Saturday, 15 March 2008* Retrieved October 14, 2008, from [http://news.bbc.co.uk/2/hi/programmes/from\\_our\\_own\\_correspondent/7296832.stm](http://news.bbc.co.uk/2/hi/programmes/from_our_own_correspondent/7296832.stm)
- Steger, U. (2004). *The Business of Sustainability: Building Industry Cases for Corporate Sustainability*. New York: Palgrave MacMillian.
- Steurer, R., Langer, M., Konrad, A., & Martinuzzi, A. (2005). Corporations, stakeholders and sustainable development I: a theoretical exploration of business–society relations. *Journal of Business Ethics*, 61(3), 263-281.
- Stiglitz, J. (1974). Growth with Exhaustible Natural Resources: Efficient and Optimal Growth Paths. *Review of Economic Studies*, 41, 123-137.

- Stoughton, M., & Levy, E. (2004). Voluntary Facility-Level Sustainability Performance Reporting: Current Status, Relationship to Organization-Level Reporting, and Principles for Progress. *Pace Environmental Law Review*, 21, 265-287.
- Sumitomo. (2007). *Sumitomo Environmental Report 2007*. Tokyo: Sumitomo Metal Mining Co., Ltd.
- SustainAbility/UNEP. (1999). *The Internet Reporting Report*. London: SustainAbility and UNEP.
- Sustainability Institute. (2010). Welcome to the Sustainability Institute. Retrieved January 10, 2010, from <http://www.sustainer.org/>
- Svensson, G. (2007). Aspects of sustainable supply chain management (SSCM): conceptual framework and empirical example. *Supply Chain Management: An International Journal*, 12(4), 262-266.
- Sylvan, R. (1994). *The greening of ethics*. Cambridge: White Horse Press.
- Teck. (2010). Sustainability Mining & Mine Safety. Retrieved January 20, 2010, from <http://www.teck.com/Generic.aspx?PAGE=Sustainability&portalName=tc>
- Teck Cominco. (2007). *Teckcominco Sustainability Report 2006: This is our future*. Vancouver: Teck Cominco Limited.
- Teckcominco. (2007). *Teckcominco Sustainability Report 2006: This is our future*. Vancouver: Teck Cominco Limited.
- TerraChoice. (2007). *The "Six Sin of Greenwashing": A Study of Environmental Claims in North American Consumer Markets*: TerraChoice Environmental Marketing Inc.
- The Balaton Group. (2010). The Balaton Group: A global network for collaboration on systems and sustainability - founded in 1982. Retrieved January 10, 2010, from <http://www.balatongroup.org/>
- The Natural Step. (2010a). Backcasting: The Natural Step. Retrieved January 20, 2010, from <http://www.thenaturalstep.org/en/backcasting>
- The Natural Step. (2010b). The Four System Conditions. Retrieved January 20, 2010, from <http://www.thenaturalstep.org/the-system-conditions>
- Therivel, R. (2004). *Strategic Environmental Assessment in Action*. London: Earthscan.
- Thornton, W. (Director). (2005). *The Old Man and the Inland Sea*. Australia.
- Tilton, J. E. (1996). Exhaustible resources and sustainable development. *Resources Policy*, 22(1-2), 91-97.
- Tilton, J. E. (1999). The future of recycling. *Resources Policy*, 25, 197-204.
- Timberlake, L. (2006). *Catalyzing Change: A Short History of the WBCSD*. Geneva: World Business Council for Sustainable Development and Earthprint Limited.
- Trucost. (2010). Trucost: Taking the Environment into Account. Retrieved January 10, 2010, from <http://www.trucost.com/>
- Tsang, S., Welford, R., & Brown, M. (2009). Reporting on Community Investment. *Corporate Social Responsibility and Environmental Management*, 16, 123-136.
- Turner, R. K. (1992). *Speculations on Weak and Strong Sustainability*. Norwich: University of East Anglia.
- UN-CBD. (2009). Operational guidance for application of the ecosystem approach. Retrieved April 02, 2009, from <http://www.cbd.int/ecosystem/operational.shtml>
- UN. (1992). AGENDA 21, *United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992*: United Nations.

- UN. (2002). *Plan of Implementation of the World Summit on Sustainable Development*: United Nations.
- UN. (2003). *Convention on biological diversity (with annexes). Concluded at Rio de Janeiro on 5 June 1992*. New York: United Nations.
- UNCTAD. (2007). *World Investment Report: Transnational Corporations, Extractive Industries and Development*. New York: United Nations Conference on Trade and Development (UNCTAD).
- UNCTAD. (2008). *World Investment Report: Transnational Corporations, and the Infrastructure Challenge*. New York and Geneva: United Nations Conference on Trade and Development (UNCTAD).
- UNDP. (2008). *Technical Note 1: Calculating the human development indices*. New York: United Nations Development Programme (UNDP).
- UNEP. (2000). *Mining and sustainable development II: challenges and perspectives*. Paris: United Nations Environment Programme.
- UNEP. (2007). *Global Environmental Outlook (GEO) 4: environment for development*. Nairobi: United Nations Environment Program.
- UNEP. (2010). The Principles for Responsible Investment. Retrieved January 10, 2010, from <http://www.unpri.org/principles/>
- UNEP and KPMG. (2006). *Carrots and Sticks for Starters: current trends and approaches in voluntary and mandatory standards for sustainability reporting*. Paris: UNEP and KPMG.
- UNEP/DTIE/ICOLD. (2001). Tailing Dams - Risk of Dangerous Occurrences, Lessons learnt from practical experience. *Bulletin, 121*.
- UNEP/SustainAbility. (2004). *Risk & Opportunity: Best Practice in Non-Financial Reporting*. London: SustainAbility.
- UNEP/SustainAbility. (2006). *Tomorrow's Value: The Global Reporters Survey of Corporate Sustainability Reporting*. London: SustainAbility.
- Unerman, J., Bebbington, J., & O'Dwyer, B. (2007). *Sustainability Accounting and Accountability*. London: Routledge.
- United Nations. (1999). *The World at Six Billion*. New York: United Nations (Population Division, Department of Economic and Social Affairs).
- United Nations and GRI. (2006). *Making the Connection: Using the GRI's G3 Reporting Guidelines for the UN Global Compact's Communication on Progress*. Amsterdam and Paris: United Nations Global Compact Office Global Reporting Initiative.
- USGS. (2008). *Mineral Commodities Summary 2008*. United States Geological Survey.
- Veiga, M. M., Scoble, M., & McAllister, M. L. (2001). Mining with communities. *Natural Resources Forum, 25*, 191-202.
- Victor, P. A. (1991). Indicators of sustainable development: some lessons from capital theory. *Ecological Economics, 4*, 191-213.
- VIGEO. (2010). Vigeo corporate social responsibility ratings agency. from <http://www.vigeo.com/csr-rating-agency/index.php>
- Villas-Bôas, R. C. (2006). *Sustainable indicators for the extraction minerals industries*. Rio de Janeiro: CETEM/MCT.
- Villas-Bôas, R. C. (2009). *Indicadores de desenvolvimento sustentável para a indústria extrativa mineral: guia prático*. Rio de Janeiro: CETEM/MCT/CNPq/CYTED.

- Villas-Bôas, R. C., Shields, D., Solar, S., Anciaux, P., & Onal, G. (2005). *A Review on Indicators of Sustainability: for the mineral extraction industries*. Rio de Janeiro: CETEM/MCT/CNPq/CYTED/IMPC.
- Villiers, C. d., & Staden, C. J. v. (2006). Can less environmental disclosure have a legitimising effect? Evidence from Africa. *Accounting, Organizations and Society*, 31, 763-781.
- Vogel, D. (2005). *The Market for Virtue: The Potential and Limits of Corporate Social Responsibility*. Washington: Brookings Institution Press.
- Voinov, A. (2008). Understanding and communicating sustainability: global versus regional perspectives. *Environment, Development and Sustainable Development*, 10(4), 487-501.
- Wackernagel, M., & Rees, W. (1996). *Our ecological footprint: reducing human impact on the earth*. Gabriola Island: New Society Publishers.
- Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). Resilience, Adaptability and Transformability in Social-ecological Systems. *Ecology and Society*, 9(2), [online].
- Walker, B., & Salt, D. (2006). *Resilience thinking: sustaining ecosystems and people in a changing world*. Washington: Island Press.
- Waltner-Toews, D., Kay, J. J., & Lister, N.-M. E. (2008). *The Ecosystem Approach: Complexity, Uncertainty, and Managing for Sustainability*. New York: Columbia University Press.
- Watkins, M. (2008). ISO 26000: the story so far. *IRCA INfrom e-zine*, 20.
- WBCSD. (2003). *Sustainable Development Reporting: Striking the Balance*. Geneva: World Business Council for Sustainable Development.
- WCED. (1987). *Our Common Future*. New York and Oxford: Oxford University Press.
- Weaver, A., & Caldwell, P. (1999). Environmental Impact Assessment for Mining Projects. In J. Petts (Ed.), *Handbook of Environmental Impact Assessment* (Vol. 2, pp. 377-403). Oxford: Blackwell Science.
- Weber, O., Koellner, T., Habegger, D., Steffensen, H., & Ohnemus, P. (2008). The relation between the GRI indicators and the financial performance of firms. *Progress in Industrial Ecology*, 5(3), 236-254.
- Welford, R. (1997). *Hijacking Environmentalism: Corporate Responses to Sustainable Development*. London: Earthscan.
- Welsh, E. (2002). Dealing with Data: Using NVivo in the Qualitative Data Analysis Process. *Forum: Qualitative Social Research*, 3(2), Art. 26.
- WGC. (2010). World Gold Council Support of the ICMM Principles. Retrieved January 10, 2010, from [http://www.gold.org/assets/file/pub\\_archive/pdf/wgc\\_support\\_of\\_ICMM\\_principles.pdf](http://www.gold.org/assets/file/pub_archive/pdf/wgc_support_of_ICMM_principles.pdf)
- Wheeler, D., & Elkington, J. (2001). The end of the corporate environmental report: Or the advent of cybernetic sustainability reporting and communication. *Business Strategy and the Environment*, 10(1), 1 - 14.
- White, A. (1999). Sustainability and the accountable corporation: society's rising expectations of business. *Environment*, 41(8), 30-43.
- White, L. (2001). Effective Governance Through Complexity Thinking and Management Science. *Systems Research and Behavioral Science*, 18, 241-257.
- Whitmore, A. (2006). The emperors new clothes: Sustainable mining? *Journal of Cleaner Production*, 14(3-4), 309-314.



- Wiedmann, T., Minx, J., Barrett, J., & Wackernagel, M. (2006). Allocating ecological footprints to final consumption categories with input-output analysis. *Ecological Economics*, 56(1), 28-48.
- Willis, C. A. A. (2003). The Role of the Global Reporting Initiative's Sustainability Reporting Guidelines in the Social Screening of Investments. *Journal of Business Ethics*, 43(3), 233-237.
- Wilson, M. (2003). Corporate sustainability: What is it and where does it come from? *Ivey Business Journal: Improving the Practice of Management*(March/April), 1-5.
- Wilson, M. J. (2003). *Independent assurance on corporate sustainability reports*. University of Calgary, Calgary.
- Woodward, D. G. (1997). Life cycle costing: theory, information acquisition and application. *International Journal of Project Management*, 15(6), 335-344.
- World Bank. (2003). *Striking a better balance: the final report of the extractive industries review*. Washington: World Bank Group.
- WRI. (2008). *Roots of Resilience, Growing the Wealth of the Poor: Ownership, Capacity, Connection*. Washington: World Resources Institute, United Nations Development Programme, United Nations Environment Programme, World Bank.
- WWF. (2007). WWF Protecting U.S. Southeast Rivers and Streams from Coal Mining. Retrieved January 20, 2010, from <http://www.worldwildlife.org/who/media/press/2007/WWFPresitem6271.html>
- WWF. (2008). *Living Planet Report 2008*. Gland: WorldWide Fund for Nature (WWF).
- Xing, Y., Horner, R. M. W., El-Haram, M. A., & Bebbington, J. (2009). A framework model for assessing sustainability impacts of urban development. *Accounting Forum*, 33(3), 209-224.
- Xstrata. (2007). *Xstrata Sustainability Report 2006*. Zug: Switzerland.
- Xstrata. (2009). *Xstrata Sustainability Report 2008*. Switzerland: Xstrata plc.
- Young, J., & Septoff, A. (2002). *Digging for Change: Towards a Responsible Minerals Future, An NGO and Community Perspective*: Mineral Policy Centre.
- Young, S. B., Dias, G., Fonseca, A., & O'Keefe, M. S. (2008). Social and Environmental Responsibility in Metals Supply to the Electronic Industry. Retrieved September 22, 2008, from <http://www.gesi.org/LinkClick.aspx?fileticket=anlAuBauWU8%3d&tabid=60>
- Young, S. B., Fonseca, A., & Dias, G. (2010). Principles for responsible metals supply to electronics. *Social Responsibility Journal*, 6(1), 126-142.
- Young, S. T. (2005). Leading Environmental Change: The Case of the Global Mining Industry. *Review of Business*, 26(1), 34-38.
- Yu, J., Yao, S., Chen, R., Zhu, K., & Yu, L. (2005). A quantitative integrated evaluation of sustainable development of mineral resources of a mining city: a case study of Huangshi, Eastern China. *Resources Policy*, 30, 7-19.
- Zadek, S., Raynard, P., Forstater, M., & Oelschlaegel, J. (2004). *The Future of Sustainability Assurance. ACCA Research Report 86*. London: Association of Chartered Certified Accountants.
- Zinifex. (2007). *Zinifex Limited Sustainable Development Report 2006*. Melbourne: Australia.
- Zink, K. J. (2008). *Corporate Sustainability as a Challenge for Comprehensive Management*. Heidelberg: Physica-Verlag (Springer).

Zmagni, A., Buttol, P., Buonamici, R., Masoni, P., Guinée, J. B., huppés, G., et al. (2009). *D20 Blue Paper on Life Cycle Sustainability Analysis: Co-ordination Action for innovation in Life-Cycle Analysis for Sustainability* (Calcas).

## **APPENDIX 1 Invitation Letters**

### **Typical Invitation Letter**

My name is Alberto Fonseca. I am a PhD candidate at the University of Waterloo's Faculty of Environment (Canada). I am writing to request a telephone interview on the day/time of your preference.

The purpose of this interview, which is likely to take 45 minutes, will be to understand your perception on the requirements of effective corporate sustainability assessments and reports. This information will be used in the context of my PhD thesis, which seeks ways to enhance corporate sustainability reporting among mining corporations. My research will also be exploring the barriers to implementing such enhancements. More specifically, the interview will focus on your opinion on two main issues:

- a) Strengths and weaknesses of GRI's, ICMM's and TSM's framework;
- b) Requirements of, and barriers to, strengthening sustainability reporting in the mining sector.

In the past two years, I reviewed numerous academic and consultancy studies on sustainability reporting in the mining sector. Many of the insights resulted from these reviews will be communicated to you during the interview. Your opinion will be very important not only to the success of this research but also to the enhancement of corporate sustainability disclosures.

All information you provide will be kept confidentially in a secure digital archive. Anonymous quotations will be used in any publications, unless you give permission for attribution. Should you permit attribution, quotations will be sent to you for permission before they are used and you will have a chance to approve the use of your name with each quotation, modify it, or ask

that it be made anonymous. Your participation is, of course, voluntary, and you may skip questions or withdraw at any time.

This study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. However, the final decision about participation is yours. If you have any comments or concerns resulting from your participation in this study, please contact Dr. Susan Sykes of this office at (519) 888-4567 Ext.36005 ([ssykes@uwaterloo.ca](mailto:ssykes@uwaterloo.ca)), myself, Alberto Fonseca, at 519-8884567 x37041 or, my supervisor, Professor Mary Louise McAllister, at 519-888-4567 x35614.

As I mentioned, the interview should take about 45 minutes. I can call you at the number, date, and time of your preference.

Many thanks in advance!

## APPENDIX 2 Semi-structured Interview Questionnaires

### Questions used in the Semi-structured Interviews

1. Do you think that corporate social responsibility and corporate sustainability are synonymous?
2. In your opinion, what are the main strengths and weaknesses of the mining companies' reports prepared according to the Global Reporting Initiative (GRI) G3 guidelines?
3. Do you believe that GRI-based reports can inform stakeholders about the contributions to sustainability of the reporting organization?
4. Do you agree that the following changes in the GRI framework would lead to more meaningful and reliable sustainability reports? What would be the barriers to implementing those changes?
  - a) context and boundaries:
    - Require facility-level reporting in addition to organizational-level reporting
    - Require reporting on the state of socio-ecological systems impacted by the organizations
    - Require assessment and reporting of cumulative effects
  - b) integration and trade-offs
    - Require integrated indicators
    - Require disclosure of trade-offs among sustainability issues/indicators
  - c) credibility and verification
    - Provide more guidance on external assurance or verification
    - Require a minimum scope in external verifications
  - d) Public participation
    - Require stakeholder consultations' role to extend beyond the identification of material "issues", to include the identification of material facilities, socio-ecological systems, purchases, products/services, performance thresholds, assurance/verification providers

5. Do you think that some of the discussed limitations above may lead to reports that mislead decision-makers?
6. Are there unique issues in the mineral/mining sector that justify particular reporting requirements?
7. To what extent do you think that enforcing sustainability reporting, through regulation/legislation, could increase the quality of sustainability reports?

Could you please indicate someone with expertise in corporate sustainability assessment and reporting to participate in this study as well?

## APPENDIX 3 Assurance Statements

Contents of Assurance Statements	Anglo American	AngloGold Ashanti	BHP Billiton	Lonmin	Newmont	Nippon Mining & Metals	Rio Tinto	Xstrata	Zinifex	Percentage in the group	ICMM Assurance Procedure requirement
Scope of engagement	✓	✓	✓	✓	✓	✓	✓	✓	✓	100%	✓
Reference to "selected" data without specifications		✓			✓	✓				33%	
Specification of categories related to the selection			✓				✓		✓	33%	
Specification of indicators verified within categories	✓			✓				✓		33%	
Reference to compliance with GRI	✓		✓	✓	✓			✓		56%	✓
Reference to compliance with GRI MMSS			✓		✓			✓		33%	✓
Reference to compliance with ICMM's principles										0%	✓
Addressee	✓	✓	✓	✓		✓	✓			67%	
Reference to all stakeholders										0%	
Responsibilities of reporter and assuor	✓	✓	✓	✓	✓		✓	✓	✓	89%	
Competency of assuor and respective team	✓		✓		✓		✓			44%	✓
Independence of assuor	✓	✓	✓	✓	✓		✓	✓	✓	89%	✓
Level of assurance	✓	✓	✓	✓	✓					56%	✓
Reasonable	✓	✓		✓	✓					44%	
Limited	✓		✓	✓						33%	
Criteria and methods used in the engagement	✓	✓	✓	✓	✓	✓	✓	✓	✓	100%	✓
Standards used in the engagement	✓	✓	✓	✓	✓			✓		67%	
Reference to AA1000AS			✓		✓			✓		33%	
Reference to ISAE 3000	✓	✓	✓	✓						44%	
Reference to ISO 19001								✓		11%	
Description of the works undertaken	✓	✓	✓	✓	✓	✓	✓	✓	✓	100%	✓
Verification of reported data	✓	✓	✓	✓	✓	✓	✓	✓	✓	100%	✓
Verification of data collection systems or controls	✓		✓	✓	✓		✓	✓	✓	78%	✓
Site visits	✓		✓	✓	✓	✓	✓	✓		78%	✓
Interviews with internal stakeholders	✓		✓	✓	✓	✓		✓		67%	✓
Interviews with external stakeholders					✓					11%	
Conclusions or opinions	✓	✓	✓	✓	✓	✓	✓	✓	✓	100%	✓
Negative	✓		✓	✓						33%	
Positive	✓	✓		✓	✓	✓	✓	✓	✓	89%	
Materiality			✓		✓			✓		33%	✓

Completeness/Inclusiveness			✓		✓			✓		33%	✓
Responsiveness					✓			✓		22%	✓
Recommendations or additional comments			✓		✓	✓	✓	✓	✓	67%	