An Extractive Sector Perspective of Risk Management and Its Influence on Corporate Sustainability: An Empirical Analysis

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This study explores how risk management (RM), affects shareholder value (SV) and corporate sustainability (CS) in extractive-sector (ES) firms. Employees of Australia's top 20 mining and oil-and-gas (O&G) firms were surveyed about their firm's risk profile, risk attitudes, and RM practices. The survey drew 496 responses from 987 employees. The literature review raised several gaps: Does RM enhance SV and CS of ES firms; How similar is RM across ES firms; Are mining and O&G risks sufficiently different to warrant splitting them? The survey findings suggest that ES-firm risk profiles, risk attitudes, and RM practices are: Broader than in non-ES firms; Important to SV via CS; and Similar within and across mining and O&G. Survey responses suggest that ES employees recognize the nature of RM and of the importance of the ES sector via employment, investment, and raw-material flows. This study affirms that mining- and O&G-firm-RM practices are converging and is a benchmark for future studies, as high-carbon energy (coal mining and O&G) is supplanted by nuclear and non-ES-renewable energy.

Keywords: Australia, corporate sustainability, extractive sector, risk management, stakeholder value

INTRODUCTION

Mounting stakeholder (including insurers) has made corporate sustainability (CS) a dominant research issue (Gallego-Alvarez and Ortas 2017; Lin et al. 2015). Over 100 nations produce minerals, and they are a vital contributor to employment and wealth flows (MCA 2020). However, prospecting for, extracting, and primary processing of minerals is a risky process, with potential for massive environmental, social, and cultural harm. Environmental, Social, and Governance (ESG) is an evolving focus in corporate risk, disclosure, and sustainability (Camilleri, 2015). The import of ESG was highlighted by Thompson's (2020) Chairman's Address in the Rio Tinto 2020 Financial Statements, where he noted that Rio Tinto's:

> "…achievements [in the prior year] were overshadowed by the destruction of two ancient [46,000-year-old] rock shelters in Juukan Gorge …in Western Australia, in May 2020.

…Following …consultations with shareholders in Australia, Europe, and North America, our [i.e., Rio Tinto's] Chief Executive, the Chief Executive of Iron Ore and the Group Executive, Corporate Relations, have left the company by mutual agreement."

Risk management (RM) is an increasingly indispensable contribution to stakeholder value (SV) and CS in mineral-focused organizations (KPMG 2020). The notion of what constitutes effective RM is in a dynamic and evolving flux. In response to that evolving flux, the authors of this study avoided the ESG focus and broadly define RM as efforts to adjust, control, and modify a firm's culture, and processes to optimize potential opportunities while managing adverse effects (ISO 3100: 2018). In explaining risk taxonomy and the importance of RM to CEOs, Hagigi, and Sivakumar (2009) assert that exogenous elements of risk are increasing in number and complexity. Further, rapid changes in the international business arena have blurred the distinction between national and international elements of risk, due to the integration across market, institutional, political, and operational risk. Risk needs to be managed not minimized—Lessard and Lucea (2009, p.296) suggest that blindly minimizing:

> ".... risk is a losing proposition in the long term and managing risk effectively can be a powerful source of competitive advantage for firms; not just a way to limit losses…...The need to understand and address risk interdependence has grown significantly with increasing levels of globalization."

In the extractive sector (ES), RM is a useful means of creating and maintaining competitive advantage. In this study, corporate sustainability (CS) is a business approach that creates and improves long-term SV by embracing opportunities and managing risks to enhance social reputation (S&P Dow Jones Indices 2021). Good RM and reporting reduce information asymmetry and, as noted by Baxamusa et al. (2015) and Choi et al. (2013), enhances the financing and capital structure options of a firm. While the socioeconomic and political environments have significant influence on firm behavior and there is a plethora of studies on these, this study focuses on a free market structure. However, this study should have significance for state-owner operations. For example, as Rooker (2015) suggests, China's national oil and petrochemical companies are mirroring or seeking to mirror …Western managerial capitalist forms of corporate organization…they should also consider how aspects of Western RM may reduce dissipation and/or misdirection of national resources.

This study uses an extensive survey to investigate how RM affects the SV and CS of Australian ES firms, compares the RM practices of the 20 largest ES firms to highlights similarities and differences in the RM practices of firms within and across mining and oil & gas (O&G). While some empirical studies have considered the individual effect of four key ES-firm risks (i.e., financial, operational, strategic and compliance; Ernst and Young 2011, there appears to be little consideration of the joint effects and management of those risks. Some studies (e.g., Hettihewa 2016) use a qualitative approach to consider the importance of RM for the ES in a sustainable economy, Berkman et al. (2002), Taylor et al. (2010), and Birt et al. (2013) use a quantitative approach via Accounting and Finance to evaluate RM and dis-closure practices of Australian listed ES firms. Other studies (Peixoto et al. 2014; Rodrigues-da-Silva and Crispim 2014; Teller and Kock 2013) are based mainly on project RM in organizations. In contrast to those earlier studies, this study uses employee perceptions to gain insight on ES RM in a broader context to bridge research gaps in the literature.

The *research question* for this study encompasses the impact of RM practices on SV and CS of firms in the Australian ES and similarities and differences in the RM practices (key risks) of firms in the ES. Along with insights as to how RM practices enhance the SV and CS of ES firms; this study also enables ES firms to extend RM well beyond traditional financial and insurable hazards to encompass the four key risks with an empirical investigation.

This study uses 496 observations from top 10 mining and top 10 O&G firms in the Australian ES (over half of the total employees of those firms). Those firms have operated for many decades with operations spanning all continents except Antarctica (Pricewaterhouse-Coopers 2011). The ES has been a key pillar

and mainstay of the Australian economy since the 19th Century gold rush (Hajkowicz et al., 2011) and furnishes the raw materials by which modern societies are constructed (Roarty 2010).

The rest of the paper is organized with: Section 2 covering the study's significance, theoretical foundation, literature review, and hypotheses; Section 3 describing the study's methodology; Section 4 discussing findings; and Section 5 concluding with, limitations, implications, and suggestions for future research.

THEORETICAL FOUNDATION

Stakeholder Theory

In general, stakeholder theory shows the importance of the commitment by firms to respond to stakeholder demands for competitive advantage and survival (Gallego-Alvarez and Ortas 2017; Roy and Goll 2014). Prior studies on corporate social responsibility (CSR) go back to the 1950s, with strong considerations on whether firms should purely concentrate on economic profits or should they follow an array of broader social goals (Bowen 1953)—a focus on stakeholders lead to Stakeholder Theory (Freeman 1984). As a result, the formerly narrowly defined economic environment of firms has extended to encompass a broader environment with environmental safety issues (direct and indirect) being added to the mix to reduce the risk of stakeholder revolts and/or defections (Greenwood 2007; Hettihewa 2016; Lin et al. 2015).

Orts and Strudler (2002) suggest that traditional stakeholder theory is inadequate in inferring environmental concerns, in that it emphasizes the benefits to human participants in business enterprise but ignores environmental interests. Stakeholder value and sustainable development are considered in previous research as having interrelated issues with CSR. The Royal Dutch Shell provided a valid example by moving from reputation low in 1995 to high in 2000 through achieving stakeholder objectives via social engagement from the *trust me approach* to *join me approach* (Greenwood 2007; Lin et al. 2015). In highlighting the importance of the integrated broader aspect of SV (Donaldson 2002, p.108) asserts that:

> "…No well-known writer on stakeholder theory has questioned the importance of shareholder value, but many have written that theory and practice should at times balance the importance of the value of money with that of other values."

Koll et al. (2005) in asserting the importance of understanding the level of engagement of stakeholders as an element in achieving sustainable development also discussed the importance of the inclusion of secondary interest groups (e.g., those with less influence on company activities than the primary stakeholder groups including employees, investors, customers, and suppliers). Baumgartner and Ebner (2010) state that communicating sustainability orientation to internal stakeholders can be more challenging than it is to external stakeholders. Specifically, it is difficult to identify and understand stakeholders' needs, interests, and values meaningful to them. According to Salzmann et al. (2005); Arlow and Gannon (1982) the effect of SV on CS depends on the specific circumstances of the industry and the position of the firm.

Contingency Theory in the Context of Risk Management

Contingency theory focuses on RM practices and organizational performance. Contingency theory is an approach which explains and clarifies how contingent factors such as uncertainty, strategy, technology, culture, organizational size, behavioral attributes of management, and other external environmental factors influence the design, management and function of organizations. Waterhouse and Tiessen (1978), Islam and Hu (2012), and Collier et al. (2006) argue that for a firm to stay sustainable, there should be alignment between its structure and context. Also, in the context of RM, achieving corporate objectives cannot be done solely by implementing sophisticated RM processes and practices but, also, requires balance with firm size, behavioral attributes of management, corporate strategy, and the RM culture of the organization. The nature of these impacts can significantly affect the sustainability and long-term survival of organizations within the ES as well as across other sectors (Lin et al. 2011).

LITERATURE REVIEW

The mining sector contributes significantly to the global economy via raw-material flows into energy and manufacturing. The total 2020 revenue of the top mining companies in the world showing was $656 billion USD. Australian top mining companies have a long history with the Australian Stock Exchange (ASX) and are a key pillar of Australia's economy. The first and second largest mining companies in the world are Australian—BHP and Rio Tinto and market capitalizations of, respectively, $180.45 billion and $146.75 billion USD (Statista 2021a). The Mining Sector kept Australia out of recession during the 2007/8 global financial crisis (GFC) and contributed to an extraordinary and durable economic boom (Garnett 2015; Hosseinzadeh 2017). Constable (2020) observed that in 2019/20 mining was Australia's largest industry and, in that financial year, contributed: $202 billion to GDP (10 percent of the economy) and 1.1 million jobs (direct and indirect) in mining, mining equipment, technology and services. Price volatility in commodities in the last few years has raised concerns about the long-term sustainability of mining companies highlighting the need for a sophisticated new look at CS, SV, and RM. The recent downturn in commodity prices has raised concerns about the profitability and the importance of improving the efficiency. Many mining companies consider raising productivity and reducing cost as key priorities (Lumley 2014), but SV, CS, and RM have becoming ever more important for sustainability, requiring more research into the field. Although the Covid -19 Pandemic slowed down many industries, the Australian mining sector shrugged-off slow growth in 2018/19 with 4.9 percent growth in 2019/20 (Constable 2020; PricewaterhouseCoopers 2020) and (so far) is not being significantly affected by the current trade stoush between China and Australia (Guardian 2021). The resilient growth of leading mining companies has illustrated the sector's strength in supporting the broader economy (PricewaterhouseCoopers 2021). However, the Covid-19 pandemic increased uncertainty, along with rising concerns over environmental issues. Thus, the ES should take advantage of their currently strengthening financial position to revalue and enhance key strategic tools, including how to better match their RM practices to the ES business milieu that is ever more sensitive to environmental conditions and global warming.

Consistent with a mature post-industrial economy, the economic contribution and capacity to provide employment are in sharp decline in Australia's manufacturing sector. In contrast to most economies in the world, Australia's mining sector has a strong and rising contribution to GDP and employment opportunities (Roarty 2010; Hajkowicz et al. 2011). These trends combined with the effects of the O&G super-profits tax (Schandl et al. 2008; Lin et al. (2015) make clear the need to research the contribution of RM to sustainability in mining and O&G operations. The foregoing assertion is strengthened by rising volatility in the ES, due to ongoing technological advances, environmental/cultural issues, and changing RM attitudes and tools (Deloitte 2012). Standard operating procedure only a few decades ago is currently seen as so profoundly deficient that many see it as breaching corporate social responsibility (CSR). Although, the ES has implemented RM practices for decades, Okoh and Haugen (2013); Schroeder and Jackson (2007) suggest that consideration of their impact should be greatly expanded.

Distinctive Risks in the Extractive Sector

Extractive sector risks are often driven by political and socio-economic concerns and uncertainties (Deloitte 2011). This study starts with the Universe Risk Model by Ernst and Young (2011) which lists common ES key risks and groups them according to their nature and impact on ES operations (see Table 1). This study discusses these and other risks and seeks to generalize them for use in a statistically testable model (see Table 2).

TABLE 1
EXTRACTIVE-ENERGY INDUSTRY RISKS CATEGORIZED BY WHAT THEY AFFECT

| Compliance risk	Financial risk	Strategic risk	Operational risk
• Climate change concerns	• Price volatility	• Competition for new energy	• Cost containment
• Uncertain energy policy	• Worsening fiscal terms	• Political constraints	• Health, safety and environmental risk
• Renewable Energy		• Access to proven reserves	• Human capital deficit
		• Renewable Energy	• New operational challenges

Adapted from: Ernst and Young (2011) – NB: Renewable energy is included in Table 1 under Compliance risk and Strategic risk; reflecting that its risk has political and public relations aspects – with feedback from the later into the former.

Also, the *Risk Radar* (Figure 1) depicts further details of the risk components. The risks at the center of the radar (dark portion) pose greatest challenge to the mining and O&G companies in the years ahead. The arrows on the outer layer indicate whether those risks (including volatility) are expected to rise or fall in importance.

The Table 1 and Figure 1 risk categories are defined as:
- Compliance risk – originates in law, regulation and/or corporate governance
- Financial risk – stems from volatility in markets and the real economy
- Strategic risk – relates to the socio-political environment, customers, competitors, and investors, and
- Operational risk – affects the processes, systems, environment, people and the overall value chain of the company

FIGURE 1
ERNST AND YOUNG RISK UNIVERSE MODEL
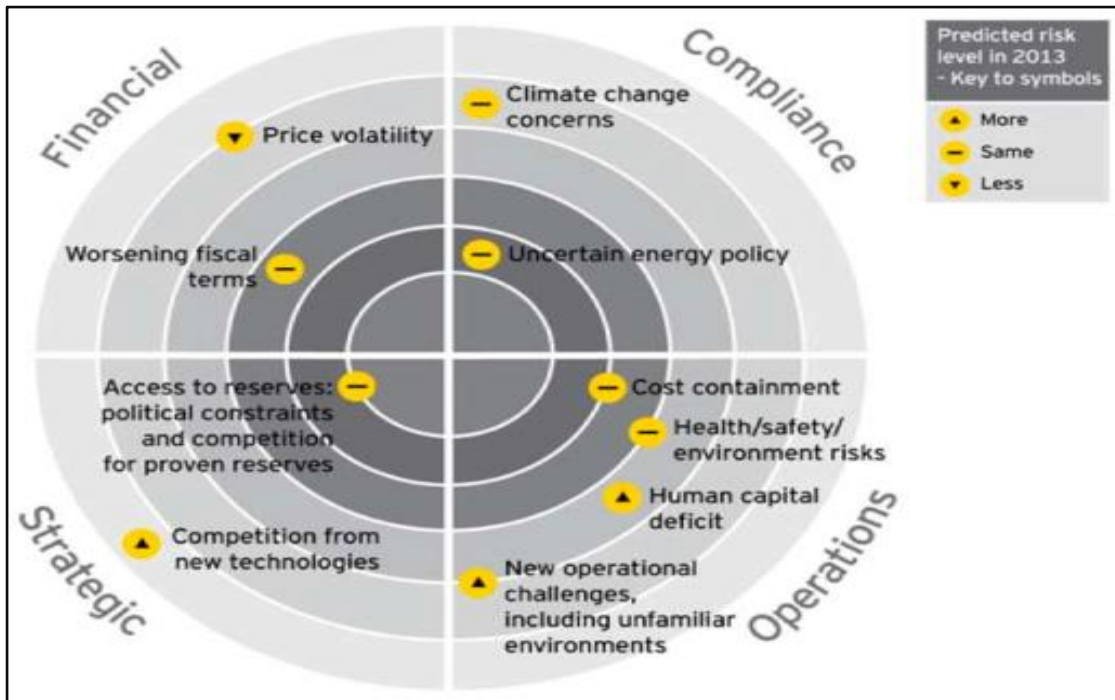
Source: Ernst and Young, 2011 p.7

The Australian Extractive Sector

Australia's mining goes back to 1791 and its export of coal began in 1799 (Geoscience Australia 2016). In 2019-20, Australia's ES (Zakharia 2020 and ABS 2021; Constable 2020):

- Delivered 10.4 percent of the Australian economy, making it the largest economic contributor with a $202 billion GDP,
- Has 240,000 people directly employed, and a total 1,100,000 direct and indirect jobs in mining, mining equipment, technology, and services,
- Grew by 4.9 percent (compared to 1.1 percent for National GDP), and
- Has a gross value added (GVA) of 11.1 percent—up from 4.6 percent in 1999-2000.

With the recent US–China and Australia–China trade disputes, mining activities and operations are increasingly volatile and uncertain (MCA 2018). Despite such challenges, mining industry revenue increased by 8 percent in 2018 and 4.9 percent in 2019/20, with most commodities experiencing higher average prices during the year. Price reductions toward the end of 2018 exposed economic uncertainty and put pressure on economic growth. Production costs of most commodities increased on average by 2 percent (MCA 2018).

Australia has substantial reserves of O&G (Figure 2 and DRET 2011). The contribution of O&G to Australia's GDP nearly doubled from 32billion AUD in 2012-13 to 61.9billion AUD in 2020 and O&G employed 17,056 people in 2020 (Statista 2021a&b). Prior to 2015-16, extraordinary levels of investment in gas extraction and LNG production facilities shaped the industry's landscape.

FIGURE 2
MAJOR MINES, OIL AND GAS PRODUCTION AREAS OF AUSTRALIA
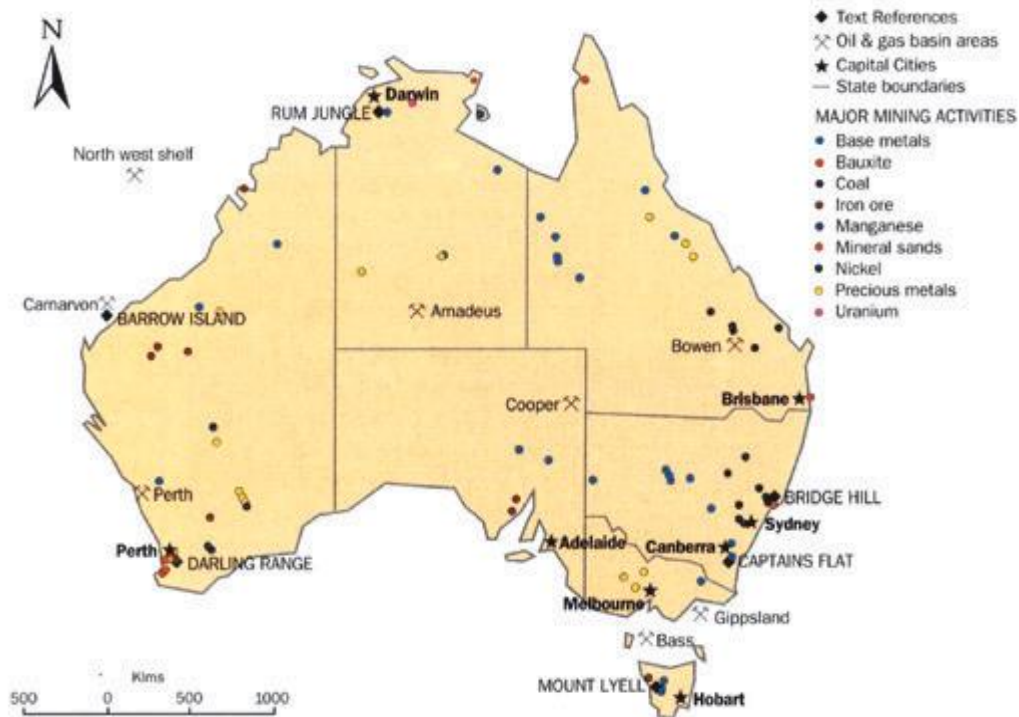
Source: Environment Australia, 2002 p.4

Australia's mining and O&G industry has been affected by rising challenges in the first two decades of the 21st century. Two PricewaterhouseCoopers (2013a&b) surveys suggest that RM and sustainability are the greatest of the rising challenges. Some economists (Akinwale 2012; Goodman and Worth 2008; Stevens and Dietsche 2008; Weinthal and Luong 2006) suggest that, in developing countries (especially if

characterized by high poverty), substantial mineral endowments can be more of a curse (e.g., corruption, civil disorder/war and invasion) than a blessing. Consistent with that theme, Steven and Dietsche (2008, p.57) note that: "...most natural resource-abundant countries have not been able to utilize revenue from natural resource extraction in a way that would have generally benefited their societies."

This problem tends to arise from issues such as income inequality and resource curse (Parcero and Papyrakis 2016); factor impacts on new investments (Brown et al. 2016), and issues over mineral ownership and royalty rates (Slade 2015).

Roarty (2010) noted that Australia was in the midst of a minerals boom. However, in the last quarter of 2017 that boom started to fade but showed substantial recovery and rising strength in 2021. Consistent with rising political and commodity-price risk, the recent emergence, surge, dampening, resurgence, and re-dampening of USA shale-oil-fracking as a dominant producer (Economist 2021) greatly added to volatility in energy markets. While the Doha forum (2016) discussions were unsuccessful in stabilizing prices by limiting output, more recent pacts between OPEC and non-OPEC nations to limit energy output have caused energy prices to rise. Also, USA oil-fracking producers appear to be more cooperative with OPEC[+] producers (Economist 2021). However, such collusive agreements have historically been highly unstable, due to shirking risk and other issues. For example, the rising risk of fossil-fuel reserves becoming stranded by the response to climate change (Gould, S. 2013) has encouraged a use-it-or-lose-it attitude that makes cooperation among producers more difficult. Specifically, "The stone age did not end because the world ran out of stones, and the oil age will not end because we run out of oil" (attributed to Don Huberts by the Economist (1999, p.59)). When rapid cost cuts (layoffs, reduced exploration, and deferred R&D) are used as quick fixes by ES firms in volatile markets, RM becomes ever more strategically important.

Risk Management: An Australian Extractive Sector Perspective

The global business environment has, recently, suffered a surfeit of adversities (e.g., natural-and-manmade disasters, financial crisis, fraud, and scandals; Lin et al. 2015). These issues and events have intensified awareness in RM and its impact on CS (Dafikpaku 2011; Lin et al. 2015). Volatility in socio-political/economic factors and in health, safety, and environmental issues have conjoined with past and recent major accidents to damage public and investor trust in the integrity of the extractive industry (Aven and Kristensen 2005; Thompson 2020). How CSR can affect financial situation of a firm is investigated in general while Goss and Roberts (2011) found that low-quality borrowers who participate in discretionary CSR spending face higher loan spreads and shorter maturities. There is a gap in literature on this relationship in terms of the Australian mining industry and part of this study is to fill this gap. RM in the ES often focuses on financial controls and regulatory compliance (Ernst and Young 2012) without considering key strategic effects, such as: are ES firms with more mature RM practices better able to:

- − Outperform their peers financially?
- − Create wealth for their stakeholders?
- − Be more sustainable?
- − Enhance their perceived legitimacy?

According to Deloitte (2019), risks in mining and O&G are continually increasing and are characterized by mounting tariffs and sanctions, unexpected cyber-attacks, uncertain tax, potential trade wars, royalty regimes, rising costs, heightened scrutiny from the investment community, environmental disasters, rising rights of traditional owners of the land (Aboriginal elders). Risks unidentified are risks that are: unmanaged and can create exposures that risk a company's sustainability, financial performance, stakeholder value, health and safety, and social license to operate. Many companies in the ES continue to address risks as a major concern and looking for better ways to manage and control risks (Deloitte 2019).

Does RM Enhance the Financial Performance and CS of Firms?

Extractive sector firms need to fully integrate RM into their business strategy—not only to minimize potential losses but to enhance financial performance and continued survival. ES firms require effective RM to achieve various corporate objectives. Given the increasing volatile business environment that ES

firms operate, tightly integrating RM into business strategy and operations becomes critical to sustainable growth (Deloitte 2019). A survey by Ernst and Young (2012) shows that over 6 of 10 respondents in the ES perceive volatility in commodity and oil prices to be the greatest challenge. According to Jonathan Blackmore, Risk Leader, Ernst and Young (2012, p.2), the risks identified in their 2011 report have intensified:

> "…The world has become complex and uncertain and executives are more worried than ever before about a broad range of different risk categories. A deteriorating economic situation, market volatility and uncertain policy outlook are piling pressure on business leaders."

An ES firm that makes appropriate strategic decisions on uncertain outcomes, optimizes losses, increases corporate legitimacy, enhances SV, and buttresses CS (Dafikpaku 2011). There are two types of safety management in the ES (Danaher 1994):

1) Occupational safety involves incidents/situations with injury to an individual and/or relatively minor property damage. These tend to be relatively high-frequency-low-severity incidents.
2) Process safety involves incidents/situations where the hazard tends to be intrinsic to the process itself and the potential consequences tend to be major.

Environmental, Social, and Governance (ESG) and the Australian ES

With the uncertainty and unprecedented economic and social change that unfolded in 2020, there has been a significant shift in the integration of environmental, social, and governance (ESG) factors into investment decision-making particularly in the ES (Mills 2021). In recent years, there has been a substantial change in the perception and understanding of the importance of ESG, and the risks and opportunities posed to the ES. Investors are increasingly demanding the ES improve its ESG performance. It is no longer sufficient for ES firms to report significant discoveries or excellent production numbers, rather companies are expected to demonstrate how they work alongside local communities and contribute to the low-carbon-economy transition and the responsible sourcing of natural resources (Mills, 2021; Pennini 2020). Thus, the transition to a low-carbon economy threatens a revenue-cost squeeze.

The concept of ESG has been described a key indicator of risk management, management competence, financial and non-financial performance, corporate sustainability and ethical impact of a corporation (Lokuwaduge and de Silva 2020; Lundstrom and Svensson 2014). As a business approach, ESG generates long-term value by controlling risks and capitalizing on opportunities associated with environmental and socioeconomic issues. This value can be created, protected, and measured in terms of operational, intellectual, financial, reputational and human capital (Heenetigala et al. 2015).

In the ES, ESG covers several issues related to: Environment: biodiversity, ecosystem services, water management, mine waste/tailings, air, noise, energy, climate change (carbon footprint, greenhouse gas), hazardous substances and mine closure; Social: human rights, land use, resettlement, vulnerable people, gender, labor practices, worker/community health & safety, security, artisanal miners, mine closure and after use; and Governance: legal compliance, ethics, anti-bribery and corruption and transparency (Heenetigala et al. 2015; Lundstrom and Svensson 2014)

ES firms in Australia have long struggled with matters related to the *green* or *sustainability* agenda (Schneider et al. 2010; Li et al. 2020). The 2019 dam collapse at Vale's mining complex in Brazil killing 270 people and the recent negative publicity of Rio Tinto's destruction of ancient aboriginal caves in 2020 are some of the kind of issues companies with a focus on ESG are striving to avoid. Thus, ESG has become very relevant in the ES primarily due to investors demanding increased attention on ESG-related matters. Presently, investors are looking beyond financial statements and now consider the ethics, competitive advantage and culture of ES organizations in Australia. Investors have also proposed new standards and frameworks against which ES investments should be measured (Li et al. 2020; Lokuwaduge and de Silva 2020).

The Australian ES is highly influenced by the ESG reporting requirements and regulations. Although, Australia is moving away from the so-called mining boom, the contribution of the ES to the Australian economy is relatively high (see pg.10). According to the Australian financial stability board's task force on climate-related financial disclosures, coal is the second biggest export, after iron ore and gas is the fifth. When the 'Paris Climate Change Targets' are implemented both thermal coal and natural gas are likely to see reductions in demand (Lokuwaduge and de Silva 2020).

Furthermore, Lokuwaduge and de Silva (2020); Lundstrom and Svensson (2014); Galbreath (2013) reports that ESG in the Australian ES is about balancing the diverse demands of communities and protecting the environment whilst making a profit. Therefore, from the perspective of the ES, ESG is about responding to stakeholders, communities and the general public on issues such as human rights, employee welfare and climate change. As shareholders and investors demand that ES firms place more emphases on ESG, the ES has had to overcome their past reputation regarding these issues. For many years firms in ES have managed to evade ESG, however, the period of avoiding responsibility has come to an end and ES firms are increasingly being called upon to explain how they plan to incorporate ESG into their exploration and planning (Mills 2021; Li et al. 2020). However, ESG is a focused subset of the broader RM challenges facing ES firms.

ESG – Challenges and Opportunities

Issues relating to ESG are rising in the agenda for companies in the ES. ESG in the sector comes with several challenges and opportunities (Lokuwaduge and de Silva 2020).

Some of the risks in the ES arising from ESG include: (a) unhappy communities disrupting expansions or operations at a mine sites; (b) Poor workplace health and safety resulting in the loss of licenses, disruption to operations, and civil or criminal liability; (c) Poor planning and design exposing infrastructure to physical climate change risks; (d) inefficient use of scarce resources like water and energy threatening business continuity; (e) environmental pollution resulting in the loss of licenses, disruption to operations, and civil or criminal liability.

According to Mills (2021); Lokuwaduge and de Silva (2020) strong ESG performance comes with several opportunities:

1. It supports the ability to attract and retain good employees in the industry and provides strong performance and stakeholder relationships that enhance access to resources and funding. Also, it offers meaningful bottom-line savings from areas such as reduced energy costs, better use of water, and more effective and efficient management of many other resources.
2. Currently, few transactions are done without ESG reviews. Responsible investment has become a reality and investors, lenders, and customers want to be kept informed on ESG issues. The need to demonstrate a track record of good ESG performance will only increase; and failures to proactive reduce access to investors and customers and raises the cost of funding.
3. Internal and external stakeholders increasingly demand transparency and performance on ESG issues. ES firms and their stakeholders face challenges in many areas including performance related to climate change, energy, water, sanitation, land use, ecosystem services, food, education, health, local infrastructure, vulnerable people, and corruption.

Australia's Renewable Energy Challenges

Australia is endowed with abundant and diverse natural resources, including several globally significant energy commodity resources. The nation's non-renewable energy resource base is increasingly expanding through discoveries made in producing regions, through application of new exploration concepts (Chu 2018; Byrnes et al. 2013). In the past 10 years renewable energy generation has more than doubled, with more than 20 percent of Australia's total electricity generation in 2019 coming from renewables (AGEU 2020; Li et al. 2020).

Safeguarding Australia's energy supply is essential to ensure there is sufficient, reliable, and affordable energy to support its states and territories as well as economic activity (Goddard and Farrelly 2018). Although Australia is an energy-rich nation, the majority of extracted energy resources such as thermal

coal, natural gas and uranium, are exported. In recent years, Australia's oil production has significantly declined, leaving most of the country's transport dependent on imports of both refined petroleum products and of crude oil feedstock that are processed in the remaining domestic refineries (Li et al. 2020; Chu 2018).

Given recent technological changes, Australia now faces several choices that will influence how its energy sector will advance (Li et al. 2020). For instance, the types of energy required for the transport sector will depend on the level of adoption of electric vehicles. Charging infrastructure will need to be further developed if large numbers of electric vehicles are adopted. Other challenges may arise due to integration into the electricity system. Some countries, including the UK, France, and Denmark, have moved to ban the sale of new petrol or diesel fueled vehicles by 2040. Alternative fuels such as hydrogen may also play a role as fuel-cell vehicles continue to be developed. All these developments and other issues influence future energy security considerations in the Australian extractive sector (Economist 1999; Li et al. 2020; Aboumahboub et al. 2020).

In response to climate change, nations (including Australia) have agreed (under the Paris Agreement) to limit global temperature rise to 1.5 – 2 degrees Celsius (AGEU 2020). This requires transitioning away from non-carbon rich power sources well before 2050 (Li et al. 2020; AGEU 2020). In Australia, tackling climate change requires at least 50-70% renewable electricity by 2030 and a transition to zero net emissions in the energy sector well before 2050 (Aboumahboub et al. 2020; AGEU 2020). In recent times, energy and climate policy uncertainties in Australia have reduced investor confidence and continue to hold the country back from making a smooth and orderly energy transition. Thus, Australian climate and energy policy must accept the need for **deep pollution reduction** from the energy sector to mitigate global temperature rises. In the absence of a credible federal climate and energy policy, states/territories, businesses, and households increasingly lead this transition (Li et al. 2020). The issues and concerns raised and discussed in this section are formed into hypotheses in the next section.

HYPOTHESES DEVELOPMENT

Hypotheses testing is used to express the relationships and interdependence between variables (Sekaran and Bougie 2009) and to determine if there is statistical means to better understand the research questions (Bulajic et al. 2012). A common response to volatility is to enhance profit by dramatically reducing cost (Mulhall and Bryson 2014; Swanepoel et al. 2014). However, the risk-return tradeoff suggests that firm value may be enhanced by an equal or greater amount by using RM to reduce risk. Thus the research hypothesis for this study is:

H_o: *Managers do not perceive that RM practices contribute significantly to CS and SV.*

Corollaries, if the above hypothesis is invalidated:
- C_1: Convergence: where competition is intense and internal and external environments are similar, RM processes across firms will converge toward one perfect archetype.
- C_2: Divergence: a sustained non-convergence of RM processes across one or more firms suggests that competition is mild and/or there are significant differences across internal and external environments.

The variables used to test the null hypothesis and its corollaries are based on prior theoretical and empirical research, the attributes/nature of ES risks, and possible mitigation and control strategies. Seven independent variables are used in the study model: 1) financial risk; 2) operational risk; 3) strategic risk; 4) compliance risk; 5) risk analysis and evaluation; 6) managing and controlling key risks; and 7) loss-prevention measures and control. The control variables are: 1) firm financial and non-financial features; 2) internal and external stakeholders; and 3) management specific variables: education, age, and experience (Nguyen et al. 2011; Taylor 2017).

METHODOLOGY

This section describes the research method of this study including data collection, variable measurement/operationalization and the analysis used to test the null hypothesis. In addressing the knowledge gap, this study seeks to determine whether RM practices contribute significantly to SV via wealth and/or CS of firms in the Australian ES. If the null hypothesis is invalidated, the two corollaries are tested. The methodology used for this study is consistent with previous studies on RM quantification, measurement, analysis, and evaluation (Akinwale 2012; Bello and Adedokun 2011; Buckby et al. 2015; Covello and Mumpower 2006; Suslick and Schiozer 2004).

Data Collection

The data set in this study was collected via questionnaires completed by 496 employees of 20 selected ES firms. The population of interest in this study was selected from the '*S&P/ASX 200*' top 100 mining/metals companies and top 100 energy/utilities companies listed on the Australian Securities Exchange (ASX), as at December 2016.

The selection was based on the market capitalization[1] of the listed companies as at December 2016. The questionnaire collected information relating to employee and manager perceptions of the RM practices of the selected companies and how it impacts on SV and CS (Saunders et al. 2012). The questions explored the importance of each RM practices employed and its influences on decision making. The responses collected from the 496 of 987 employees of the selected companies, is a 50.3 percent response rate (satisfactory per Saunders et al. 2012; Sekaran and Bougie 2009).

Variable Measurement

Table 2 depicts the details of variables and number of questions included in the questionnaire of this study. It also ties those questions back to key variables, to indicator issues and to key prior studies.

TABLE 2
DISCUSSION OF RISK CATEGORIES AND RESPONSES EVALUATED IN THIS PAPER'S MODEL

Variable	Indicator	Previous studies	Q #
Financial risk	Financial risks are among the most important risks that determine the success or failure of any private and public project (including those of ES firms). Major financial risk faced by ES firms are interest rate risk, foreign exchange risk, liquidity risk and commodity price risk. There are a number of financial instruments that can be used to measure, control and manage financial risks. The main financial risk management activities are diversification and risk hedging using various instruments including derivatives and structured products. Prior studies show that effective financial risk management strategies and implementation has a strong positive relationship with firm value.	Allayannis et al. 2001; Dionne 2013; Papaioannou 2006; Savas and Kapusuzoglu, 2020. Akomea-Frimpong and Osei-Kyei, 2020; Phan et al. 2020; Jokhadze and Schmidt 2020	7
Operational risk	ES activities and operations undergo intensive processes which generates many risks. This makes risk management particularly important in the ES. Operational risk affects more systematic aspects of ES activities and operations and requires efficient management to enhance sustainability. They are risks that	DRET 2008; Hanna et al. 2003; Miller and Lessard 2001 Tubis et al. 2020; Markou and Corsten 2021	7

	can be readily identified as having impact on operations and can affect outcomes significantly. These types of risks are integral and unavoidable to measuring and managing operational risks and require rigorous and systematic risk processes (especially planning and maintenance of safe and secure operations.		
Strategic risk	ES firms face complex challenges due to the risky operational environment of exploration and production activities and therefore require workable strategic decisions. Strategic risks are those risks which affect business survival, strategic goals or long-term sustainability of an operation.	Beasley et al.2007; Drew et al. 2006; Mojarad, et al. 2018; Meto and Medina, 2020.	6
Compliance risk	Defining and measuring risk in compliance management is becoming increasingly complex and challenging task for ES firms. Changes to regulatory, legislative or compliance regimes pose risks that are among the most challenging. If these risks are not properly addressed, they can have serious consequences, including protracted permitting timeframes, prosecution, enforced shutdown, production, and reputation consequences.	DRET 2008; OECD 2004; PricewaterhouseCoopers 2013a; Silvestre and Gimenes 2017; Krepysheva et al.2020	6
Risk analysis & evaluation	It is widely acknowledged in the ES that the various techniques of risk analysis and evaluation greatly contribute toward improvements in the safety of complex operations and equipment. Risk analysis and evaluation is the process of assessing, quantifying, 50ecognized50g, analysing, and evaluating risks. Risk has been measured and quantified by researchers in different ways and various techniques ranging from simple qualitative methods to advanced quantitative methods are used to identify and analyse risks.	Buckby et al. 2015; Covello and Mumpower 2006; Suslick and Schiozer 2004; de Moura-Maciel et al. 2019; Tubis et al. 2020	10
Managing and controlling risks	ES operations all over the world are 50ecognized as one of the riskiest industrial operations. Therefore, understanding ES risks is the first step in effectively managing and controlling, and ultimately mitigating them.	Bekefi and Epstein 2008; Hagigi and Sivakumar 2009; Meulbroek 2002a; Meulbroek 2002b; Liu et al., 2019; Emery et al. 2020	10
Loss prevention measures & control	Loss prevention measures are meant to reduce the probability of losses and Improve sustainability performance.	Hofman 2007; Yang 2000; Liu et al. 2019	5

Tables 3 and 4 provide the dummy variables used to study firms' features and managers' characteristics. Statistical analysis was done using *social science software 23.0* (SPSS) and includes descriptive statistics, independent sample *t*-test, and multiple regression analysis.

TABLE 3
DUMMY VARIABLES USED TO STUDY FIRMS' FEATURES

Variables	Dummy variables take the value of 1 if all the firm's:
Corporate objectives – Financial	Financial objectives are significant, otherwise 0.
– Non-financial	Non-financial objectives are significant, otherwise 0.
Stakeholders – Internal	Internal stakeholders are significant, otherwise 0.
– External	External stakeholders are significant, otherwise 0.

TABLE 4
DUMMY VARIABLES USED TO STUDY MANAGERS' FEATURES

Firm Managers'	Dummy variables take the value of 1 if the firm manager's:
– Educational background	Have a master degree or more, otherwise it is 0.
– Age	Age is 50 and above, otherwise it is 0.
– Experience	Have been in their position longer than 15 years otherwise it is 0.

Regression Model

Regression analysis is a reliable method of identifying and analyzing which variables have impact on any topic of interest (Schneider et al. 2010). In this study, a regression analysis is adopted in other confidently determine which risk management variables and firm and manager characteristics influence corporate sustainability. This will provide insights to the selected firms in making informed decisions, allocate resources more efficiently, boost their bottom line and ultimately remain sustainable. This study's samples and findings can be statistically generalized. The study uses a sample selected from top 20 diversified companies in the mining and O&G sectors in Australia and listed in the Australian Securities Exchange (ASX). In terms of operations and revenue, these companies represent more than 50% of the top 100 mining and O&G companies operating in Australia. In addition, these companies have been operating in Australia for several decades and have operations in major cities around the world, hence the findings of this study can be generalized.

The following is an estimation model used to test the null hypothesis.

$$CS = a_0 + a_1 FR_k + a_2 OR_k + a_3 SR_k + a_4 CR_k + a_5 RAE_k + a_6 MCR_k + \\ + a_7 LPM_k + a_8 AGE + a_9 EDU + a_{10} EXP + a_{11} COF + \\ a_{12} CONF + a_{13} SHI + a_{14} SHE + \varepsilon \tag{1}$$

$$SV = b_0 + b_1 FR_k + b_2 OR_k + b_3 SR_k + b_4 CR_k + b_5 RAE_k + b_6 MCR_k + \\ b_7 LPM_k + b_8 AGE + b_9 EDU + b_{10} EXP + b_{11} COF \\ + b_{12} CONF + b_{13} SHI + b_{14} SHE + \varepsilon \tag{2}$$

where: a_0 and b_0 = Constant terms
$a_1 - a_{14}$ and $b_1 - b_{14}$ = Regression coefficient
FR_k = Financial risk of firm k
OR_k = Operational risk of firm k
SR_k = Strategic risk of firm k
CR_k = Compliance risk of firm k
RAE_k = Choice of risk analysis and evaluation method of firm k
MCR_k = Managing and controlling key risks of firm k
LPM_k = Loss prevention measures and control undertaken by firm k
AGE = Manager's age
EDU = Manager's education

EXP = Manager's experience
COF = Firm's corporate objective (financial)
CONF = Firm's corporate objective (non-financial)
SHI = Firm's internal stakeholders
SHE = Firm's external stakeholders
ε = Error term

RESULTS AND ANALYSIS

Descriptive Statistics

Table 5 presents the demographic characteristics of the respondents in this study and suggests that the attributes of mining-company and O&G-company employees are similar in terms of:

- Gender mix – the ES appears to be a male-dominated sector, but O&G firms, with 13.8 percent of employees being female are a little more gender balanced than mining firms,
- Age mix – both mining and O&G firms have just under half of their mangers between 40-49 years old and around 80 percent of their managers are over 40 years old,
- Education – O&G employees appear to be a little more educated than mining employees,
- Experience – mining firm employees appear to be more experienced than O&G firm employees, and
- Staffing structure appears to be very similar across mining and O&G firms.

TABLE 5
QUESTIONNAIRE RESPONDENT DEMOGRAPHICS

Characteristics		Mining		O&G	
		Frequency	%	Frequency	%
Gender	- Male	232	90.3	206	86.2
	- Female	25	9.7	33	13.8
Age	- 20-29	0	0	0	0
	- 30-39	44	17.1	55	23.0
	- 40-49	120	46.7	109	45.6
	- >50	93	36.2	75	31.4
Education	- Diploma	14	5.4	5	2.1
	- Bachelor	114	44.4	115	48.1
	- Masters	115	44.7	101	42.3
	- PhD	14	5.4	18	7.5
Experience	- <1	12	4.7	12	5.0
	- 1-5	45	17.5	34	14.2
	- 5-10	51	19.8	27	11.3
	- 10-15	55	21.4	42	17.6
	- >16	94	36.6	124	51.9
Dept.	- Exploration & Production	66	25.7	61	25.5
	- Human Resources & Admin.	7	2.7	4	1.7
	- Finance and Accounts	34	13.2	30	12.6
	- Information Technology	9	3.5	6	2.5
	- Construction & Shipping	11	4.3	9	3.8
	- Engineering & Projects	23	8.9	20	8.4
	- Business Development	14	5.4	28	11.7

				37	14.4	42	17.6

RM practices							
- Health, Safety, Environment & Communities				37	14.4	42	17.6
- Risk & Compliance				40	15.6	25	10.5
- Strategic Planning				16	6.2	14	5.9

In terms of the departments, the majority of managers in the mining firms are from exploration and production (25.7 percent), risk and compliance (15.6 percent) and health, safety, environment and communities (14.4 percent). For O&G firms, the majority of the managers were from exploration and production (25.5 percent), health, safety, environment and communities (17.6 percent), finance and accounts (12.6 percent).

Risk management practices in mining and O&G firms: Rather than presenting the descriptive statistics for mining-company and O&G-firm RM practices in separate tables, Table 6 presents the Likert values in an expanded ratio, with the mining value as the numerator and the O&G as the denominator.

Table 6 presents both values in a ratio where the first value in a cell is for mining and the second value in that cell is for O&G. Managers were asked to rank statements based on their RM practices and their responses provided a five-point Likert-scale ranking for each category. Those results do not exhibit a wide range of variation within these categories across either the mining firms or the O&G firms. In both categories of firms, risk analysis and evaluation functions had the lowest mean Likert values, at 3.24 and 3.39 respectively, for mining firms and O&G firms and standard deviations of 0.536 and 0.560, respectively. These findings suggest that managers across the ES believe that risk analysis and evaluation can be significantly improved. However, for the RM practices, the ES managers are reasonably confident in the RM quality performance of their firms.

Table 6 suggests that mining-firm managers and O&G-firm managers have similar views on the RM capabilities of their firms. However, (based on the minimum values) some mining-firm managers appear to have significantly lower faith in the financial-, operational-, and strategic-risk abilities of their firms, but much more faith in the compliance-risk capabilities of their firms than the O&G managers.

TABLE 6
COMPARISON OF THE *MINING-TO-O&G* DESCRIPTIVE STATISTICS FOR RM PRACTICES

RM practices	Likert 1-5 scale, with 5 being best quality – mining/O&G managers						
	Statement #	Mean	Median	Mode	Min.	Max.	SD
Financial risk	7	4.04/4.13	4.00/4.14	4.00/4.14	2.14/2.86	5.00/5.00	0.389/0.437
Operational risk	7	4.18/4.19	4.28/4.14	4.43/4.14	1.00/2.57	5.00/5.00	0.491/0.387
Strategic risk	6	4.01/3.91	4.00/4.00	4.17/3.38	2.00/2.83	5.00/5.00	0.481/0.405
Compliance risk	6	4.27/4.28	4.34/4.34	4.17/4.33	3.00/2.30	5.00/5.00	0.454/0.427
Risk analysis & evaluation	10	3.24/3.39	3.30/3.50	3.60/3.40	1.40/1.40	5.00/4.80	0.536/0.560
Manage & control key risks	10	4.13/4.19	4.20/4.20	4.20/4.20	2.40/2.40	5.00/5.00	0.438/0.424
Loss prevention measures & control of key risks	5	4.14/4.23	4.25/4.00	4.25/4.00	2.00/2.00	5.00/5.00	0.560/0.555
Total	51	na	Na	na	na	na	na
Average	na	4.00/4.04	Na	na	1.99/2.34	5.00/4.97	0.76445/0.456
Average	na	0.9901	na	na	0.6832	0.7824	0.8232

Independent Sample t-Test

Independent sample *t*-test is used in this study to determine whether there are significant differences in the RM practices between the selected mining and O&G firms. Table 8 suggests there are significant differences between the RM practices of the selected mining and O&G firms, only for financial, strategic, and risk analysis and evaluation risks. However, Table 6 shows that while those differences are statistically significant, they are very small. Tables 6-8 confirm that managers of mining and O&G firms perceive similar risks, use similar RM tools/approaches, and where there are differences (however statistically significant) they are, in practical terms, insignificant. This implies and suggests the contingency theory supporting the influence of the industry culture (Roy and Goll 2014). Thus, if variances in RM practices are due to differences in firm RM strategies, policies, and guidelines, then Tables 6 confirms Corollary 1 and precludes Corollary 2 by that confirmation.

TABLE 7
_T_-TEST ON DIFFERENCES IN THE RM PRACTICES OF MINING AND O&G FIRMS

RM practices	Mining, O&G	
	t-values	*p*-values
Financial	-2.355	0.019**
Operational	-0.451	0.652
Strategic	2.372	0.018**
Compliance	-0.203	0.839
Risk Analysis and Evaluation	-2.912	0.004***
Managing and controlling key risks	-1.754	0.080
Loss prevention measures and control of key risks	-1.947	0.052

Note: confidence levels of: <0.01 and <0.05, are denoted by, respectively, ***, **

Multiple Regression Analysis

This study uses multiple regression analysis (Eqns (1) and (2)) to investigate the impact of RM practices, manager attributes, and firm attributes on SV and CS.

Mining Company Results

Table 9 shows that the models have good-to-strong predictive powers *vis-à-vis* the SV and CS proxies. The predictive power displayed in Table 8 invalidates the null hypothesis. The R^2 values in Table 9 show that 42.5 and 37.4 percent of the variability in SV and CS of the selected mining companies can be explained by the RM practices and firm and manager characteristics. The *F*-statistics and significance levels (sig) indicate that these two models are statistically significant.

TABLE 8
PREDICTORS OF CS AND SV – MODEL SUMMARY (MINING)

Regression analysis statistics	Mining	
	CS	SV
R	0.65200	0.61200
R^2	0.42500	0.37400
Adjusted R square	0.39200	0.33800
Std. error	0.42572	0.45905
Mean square	2.31700	2.17600
F-statistics	12.78700	10.32500
Significance levels	0.00000	0.00000

Table 9 suggests that CS is significantly affected by: risk analysis and evaluation (β= 0.132 and p= 0.032); managing and controlling key risks (β= 0.277 and p= 0.000); loss prevention measures and control (β= 0.150 and p= 0.009); and corporate objectives (non-financial) (β= 0.240 and p= 0.000).

The coefficients of the independent variables are positive, except for financial risk, operational risk, managers' age, managers' education, and internal stakeholders. Risk analysis and evaluation is statistically significant at 5 percent level while managing and controlling key risks, loss prevention measures and control and corporate objectives (non-financial) are statistically significant at 1 percent.

<div align="center">

TABLE 9
COEFFICIENT FOR PREDICTORS OF CS AND SV (MINING)

</div>

Models	Mining		Collinearity tolerance	Statistics VIF
	CS	SV		
Constant	0.692	0.916	Na	Na
Financial Risk	-0.034 (0.552)	0.008 (0.900)	0.631	1.585
Operational Risk	-0.035 (0.596)	0.042 (0.547)	0.560	1.785
Strategic Risk	0.090 (0.141)	-0.023 (0.718)	0.732	1.367
Compliance Risk	0.089 (0.151)	0.077 (0.231)	0.729	1.372
Risk Analysis and Evaluation	0.132** (0.032)	0.102 (0.113)	0.540	1.852
Managing and Controlling Key Risks	0.277*** (0.000)	0.289*** (0.000)	0.638	1.567
Loss Prevention Measures & Control	0.150*** (0.009)	0.221*** (0.000)	0.626	1.598
Managers_ *AGE*	-0.018 (0.755)	0.073 (0.221)	0.724	1.381
Managers_ *Experience*	0.009 (0.881)	-0.083 (0.171)	0.966	1.035
Managers_ *Education*	-0.016 (0.752)	0.031 (0.555)	0.703	1.422
Firm_ *Corporate Objective (Financial)*	0.018 (0.727)	-0.005 (0.932)	0.853	1.172
Firm_ *Corporate Objective (Non-Financial)*	0.240*** (0.000)	0.085 (0.160)	0.719	1.391
Firm_ *Stakeholders (Internal)*	-0.019 (0.719)	-0.030 (0.590)	0.824	1.213
Firm_ *Stakeholders (External)*	0.016 (0.770)	0.073 (0.191)	0.830	1.205

Note: confidence levels of: <0.01, <0.05, and <0.1 are denoted by, respectively, ***, **, and *

Also, managing and controlling key risks (β= 0.289 and p= 0.000), and loss prevention measures and control (β= 0.221 and p= 0.000) are statistically significant and impact on SV. Collinearity is not an issue (i.e., the collinearity tolerance tests are all ≤ 1.0 and the variance inflation factor (VIF) values are all well below 10).

Oil and Gas Company Results

Table 10 also shows that the models have very good-to-strong predictive powers *vis-à-vis* SV and CS proxies. The R^2 values in Table 10 indicate that 43.9 and 38.2 percent of the variability in SV and CS of the selected O&G firms can be explained by, respectively, the RM practices, manager, and firm characteristics. The *F*-statistics and significance levels (sig) in Table 10 also indicates that the two models have statistically significant outcomes.

TABLE 10
PREDICTORS OF CS AND SV – MODEL SUMMARY (O&G)

Regression analysis statistics	O&G	
	CS	SV
R	0.66300	0.61800
R^2	0.43900	0.38200
Adjusted R square	0.40400	0.34400
Std. error	0.33728	0.38432
Mean square	1.42400	1.46200
F- statistics	12.51900	9.90000
Significance levels	0.00000	0.00000

Table 11 reveals that all the variables do not significantly impact on CS except for strategic risk (β= 0.129 and *p*= 0.020), compliance risk (β= 0.145 and *p*= 0.018), managing and controlling key risks (β= 0.218 and *p*= 0.002), loss prevention measures and control (β= 0.168 and *p*= 0.009), managers' age (β= -0.156 and *p*= 0.079), managers' experience (β= 0.158 and *p*= 0.068), and corporate objectives (non-financial) (β= 0.118 and *p*= 0.051). Except for managers' age, managers' education, and stakeholders (internal), all other variables have positive signs. Managers' age, managers' experience, corporate objectives (non-financial), strategic risk and compliance risk are statistically significant at, respectively, 10 and 5 percent while managing and controlling key risks and loss prevention measures and control are statistically significant at 1 percent.

Although managers' education and stakeholders (internal) have negative signs, none are statistically significant. Findings reveal that operational risk (β= 0.122 and *p*= 0.059), risk analysis and evaluation (β= 0.104 and *p*= 0.087), managing and controlling key risks (β= 0.220 and *p*= 0.003), loss prevention measures and control (β= 0.193 and *p*= 0.004) managers' age (β= -0.237 and *p*= 0.011), and managers' experience (β= 0.154 and *p*= 0.089) significantly impact on SV. Collinearity is not a problem as all of the tolerance statistics are under 1.0 and all the VIF values are below 10.

TABLE 11
COEFFICIENT FOR PREDICTORS OF CS AND SV (O&G)

Models	O&G		Collinearity tolerance	Statistics VIF
	CS	SV		
Constant	1.717	1.733	Na	Na
Financial Risk	0.012 (0.825)	0.062 (0.292)	0.753	1.328
Operational Risk	0.038 (0.532)	0.122* (0.059)	0.516	1.937
Strategic Risk	0.129** (0.020)	-0.064 (0.271)	0.624	1.604
Compliance Risk	0.145** (0.018)	0.069 (0.283)	0.807	1.238

Risk Analysis and Evaluation	0.039 (0.501)	0.104* (0.087)	0.664	1.506
Managing and Controlling Key Risks	0.218*** (0.002)	0.220*** (0.003)	0.827	1.209
Loss Prevention Measures and Control	0.168*** (0.009)	0.193*** (0.004)	0.673	1.486
Managers_ *AGE*	-0.156* (0.079)	-0.237** (0.011)	0.321	3.117
Managers_ *Experience*	0.158* (0.068)	0.154* (0.089)	0.931	1.075
Managers_ *Education*	-0.039 (0.458)	-0.014 (0.797)	0.337	2.972
Firm_ *Corporate Objective(Financial)*	0.068 (0.230)	-0.056 (0.342)	0.797	1.254
Firm_ *Corporate Objective (Non-Financial)*	0.118* (0.051)	0.047 (0.456)	0.696	1.437
Firm_ *Stakeholders (Internal)*	-0.045 (0.391)	0.018 (0.738)	0.920	1.087
Firm_ *Stakeholders (External)*	0.085 (0.142)	0.116 (0.057)	0.755	1.324

Note: confidence levels of: <0.01, <0.05, and <0.1 are denoted by, respectively, ***, **, and *

CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH

As part of addressing several research gaps in the RM literature, this study assesses (for firms in the Australian ES) the perceived effect of RM practices, firm attributes, and managers' attributes on SV and CS. It surveyed 496 employees of top 20 multinational mining and O&G companies in Australia (over half of the total employees). It was found that managers perceive that RM practices contribute significantly to SV and CS. The significance of RM leads to the conditional notions of RM convergence and divergence; with the former occurring in highly competitive environments and the later suggestive of slack non-competitive environments. While the t-test analysis (Table 8) suggests that the latter is stronger, inspection and ratio comparison of the absolute differences (Table 6) show the differences to be significant but very small. Given that practical considerations should always trump even the most statistically significant trivia, this study affirms that mining- and O&G-firm RM practices appear to be converging. Confirmation that RM practices are converging obviates the need to study the causes of divergence in RM practices.

Major contributions of this study to the literature include, it: 1) Adds to the understanding of RM effects on key risks of ES firms and on the CS of those firms; 2) Uses empirical analysis to consider and evaluate the effect of corporate-specific and manager-specific characteristics on the RM practices of top mining and O&G firms in Australia for the first time with an empirical investigation; and 3) Identifies several interesting notions for future research.

This study's findings should be useful to researchers, managers of multinational corporations (MNCs) in the ever-growing extractive industry, policy makers, and stakeholders. Specifically, the high-risk nature of the ES is often interwoven with social, economic, and political interests of the global community.

The findings of this study have important practical implications for industry leaders and regulators in Australia in their efforts to improve the RM practices of ES firms and for the managers of those firms to enhance the: 1) Effect of RM practices on their operations; 2) Opportunities for RM improvement; and 3) Links between RM and shareholder/stakeholder satisfaction. These findings should be useful to investors in raising their understanding on how the four key risks impact ES activities and operations in Australia and that enhanced understanding should add insight into how to diversify investment portfolios.

The findings of this study may also provide insights that may assist regulators and supervisory bodies in the ES to further strengthen the regulations governing RM best practices. Considering the nature of ES firm operations and its impact on the environment, firms in the sector should be encouraged to be

transparent in their RM practices to enhance their social license to operate. Stringent, well-regulated, and standardized RM practices will enhance efficiency, consistency, and reliability in the ES RM practices.

This research is not free from limitations. A clear limitation of this study is the presumption that an analysis of the perceptions of executives and senior managers reveals reality. Future research should look for means to cross verify the findings of this study using other data sources (e.g., the perceptions of other primary and secondary stakeholders). While this study considers RM practices of large multinational firms in two globalized industries, in one country, it provides stimulus for future research to incorporate further developments in a broader international perspective. Also, the influence/interaction of the culture of the economy that the firms operate and the country specific factors (the contingency theory), towards RM processes would be another aspect for future research.

ENDNOTE

[1.] Market capitalisation is the aggregate valuation of a company based on its current share price and the total number of outstanding stocks.

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APPENDIX: KEY DEFINITIONS AND ACRONYMS

1. *Risk management* (RM) is: Efforts to adjust, control, and modify a firm's culture, and processes to optimize potential opportunities while managing adverse effects.
2. Environmental, Social, and Governance (ESG) is: An evolving focus in corporate risk, disclosure, and sustainability.
3. *Corporate sustainability* (CS) is: A business approach to create and improve long-term stakeholder value by embracing opportunities and managing risks that enhance social reputation.
4. *Stakeholder value* (SV) involves: creating a favorable level of return on investment for all stakeholders in an organization.
5. *Extractive sector* (ES) companies: extract oil, minerals, metals, aggregates, and/or other hydrocarbons from the ground. Examples of extraction include dredging, quarrying, oil and gas extraction and mining.
6. *Research and development* (R&D) includes all: activities initiated to explore, innovate, and introduce new products and services in the company. It is the first stage in business development and its aim is to develop new ideas, products, and services to create value for the organization and improve its profitability.
7. *Market capitalization* is: the aggregate valuation of a company based on its current share price and the total number of outstanding stocks.