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Influence of regulation and information on environmental investment decision-making: An experimental study

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Abstract

Previous empirical studies provide mixed results on the relationships between regulatory and human factors in relation to corporate environmental informational strategies on individual environmental investment decision-making. We investigate the relationships by testing hypotheses from socio-political and cognitive dissonance theories using an experiment. We find that both regulatory climate and information strategy have strong main effects on individual environmental investment decision-making. However, contrary to the literature, these two variables do not have any interaction effect on individual environmental investment decision-making. The results are consistent with the predictions of the institutional and legitimacy theories but inconsistent with the interaction effect of the two variables predicted by self-justification theory. Nevertheless, we show that both regulatory influence and environmental information strategy can be highly desirable social control options for business organisations to include environmental and ethical drivers in investment decision-making.

Keywords: Regulation, Information Strategies, Environmental Investment Decision-making, Experimental Study.

1. Introduction

Most investors concentrate on financial returns from their investments (Fayers, 1999). However, as social values change, a growing number of investors are becoming aware of the links between their investments and ecologically sustainable development (Charnley & Engelbert, 2005; Wagge et al. 2005; Masurel 2007). This leads to the concept of environmental investment, which considers the social and environmental consequences of investments and meets certain baseline standards of corporate social responsibility (O'Rourke, 2003). Over the past decade, the concept of environmental investment has expanded to include the simultaneous consideration of economic growth, environmental protection, and social equity in business planning and investment decision-making (Vogel, 2002; Jolley, 2007). With the growing importance of environmental investment as a means towards future organisational viability, researchers and government policy-makers have shown increasing interest in understanding the individual environmental investment decision-making process, and the factors influencing the process (e.g., Swain & Haka, 2000; Wagge et al. 2005; Lin et al. 2007). Increasingly, firms and private sector investors are beginning to understand the role of environmental investments and to identify the potential role of their investment in assisting moves towards ecologically sustainable development (Srivastava, 1995). In recent years, environmental investment has increased in importance for government policy makers as well, particularly in the US (US EPA 1996, 1998, 2000; Michelson et al. 2004), in the UK (Chapple et al. 1999; Paton et al. 2000), and Australia (Fayers, 1999; Peel, 2005; Hajkowicz, 2007; Higgins et al. 2008; Marinoni

et al. 2008) by making improvements in corporate environmental performance through changes in the nature of investment (CSIRO SEI Fact Sheet, 2004).

Two previous studies examine the influence of external regulatory climates and internal environmental management strategies on environmental investment decision-making. First, Flannery & May (2000) investigate the demographic and external regulatory influences shaping the environmental investment decision-making of managers in the US metal-finishing industry. The study focuses on individual and contextual or situational factors influencing environmental investment decision-making in organisations. The study recommends that future research should continue to examine the effects of both demographic and regulatory influences on environmental investment decision-making in a diversity of organisations, industries, and countries. Following this study, Foulon et al. (2002) examine the influence of regulatory factors and environmental information strategies on firms' adoption of pollution prevention strategies. They focus on traditional regulation and public disclosure to examine the relative impact of these two instruments in adopting pollution prevention strategies in the context of the Canadian pulp and paper industry. The study suggests that traditional environmental regulation in the presence of environmental information strategies creates additional and strong incentives for firms to adopt environmentally friendly pollution prevention strategies.

In general, prior research has found that a firm's regulatory climate and information strategy are the two most important factors that influence individual environmental investment decision-making. However, the extent to which these two factors influence individual environmental investment decision-making and/or whether there is any interaction between these two factors that may influence the process is still unknown. This study has two primary aims in addressing this issue. The first aim is to examine whether a firm's regulatory climate and information strategy affect individual environmental investment decision-making. The second and associated aim is to examine the impact of any interaction effect of the two variables on individual environmental investment decision-making.

This paper addresses these aims through an experiment. The experiment is a case study that manipulates a firm's regulatory climate (coercive government regulatory climate and voluntary industry self-regulatory climate) and information strategy (provision of voluntary environmental information strategy and provision of conventional environmental information strategy) in a 2 x 2 between-subjects design. Three environmental investment decisions situations are considered: (1) "Managers willingness to undertake environmental investment to avoid a firm's future environmental risks", (2) "Managers' willingness to undertake environmental investment in a firm's pollution prevention strategies", and (3) "Managers willingness to incorporate environmental considerations into a firm's new investment decisions".

In brief, our results are as follows. We find that a firms' regulatory climate has a significant influence on individual environmental investment decision-making. In particular, we find that managers' who work in a flexible industry self-regulatory climate are more willing to make environmentally friendly investment decisions than managers who work in a stringent government regulatory climate. Our result is consistent with the findings of previous studies, which suggested that business managers will act more proactively to make environmentally friendly investment decisions in a flexible regulatory climate rather than in a stringent regulatory climate. Further, we find that firms' environmental information strategy has significant influence on how managers make their environmental investment decisions. In particular, we find that managers are more willing to undertake environmental investments in a situation where the firm has a voluntary environmental information strategy that provides direction to the managers to operate in a sustainable way, as opposed to a situation where the firm has a conventional environmental information strategy. However, our results did not reveal any significant interaction effect between the two variables on individual environmental investment decision-making.

The findings of the study also have implications for a number of stakeholder groups. First, the findings of our study will help policy-makers to design an effective regulatory policy that can improve environmental performance at particular facilities that has long been considered as an increasingly important but rather difficult task for government policy-makers. Second, the findings of our study have implications for business managers and academic researchers as it provides a useful empirical evidence of the relative

effectiveness of conventional and voluntary environmental information strategies that can encourage corporate managers to make environmentally friendly investment decisions. These issues are important in setting effective corporate environmental management strategies that can encourage managers of business organisations to adopt “beyond compliance” practices that enhance corporate environmental performance. Finally, the relationships explored through this study may explain and contribute to the inconsistent findings in the existing research examining the role of human factors in influencing socially responsible investment decision-making.

The remainder of the paper proceeds as follows. First, we provide an overview and justification of the context of this study. Second, we develop the theoretical basis and development of hypotheses of this study. Thirdly, we describe the research method used in this study. Section four presents the results of this study. The final section offers some concluding remarks.

2. The context

The context of the study is the Australian offshore petroleum industry. The Australian offshore petroleum industry is an ideal industry sector to study for the following reasons. First, offshore oil and gas exploration, production and transportation cause significant concern to human health and the marine environment. These matters have been at the top of the environmental agenda for most offshore oil producing nations (Elkington, 1999). Second, the offshore petroleum industry requires large capital investment, with a significant environmental capital investment component (Alciatore, Dee & Easton, 2004; APPEA, 2003, 2004; Sarker & Burritt, 2005). Between 1994 and 2003, the industry attracted large capital investment of over \$7,361 million (APPEA, 2004). Third, the industry is characterised by both government and industry controlled regulatory regimes, which provides an opportunity to examine the relative efficacy of the two regulatory regimes in making environmentally friendly investment decision-making. Finally, the wide range of management positions in this sector provides an opportunity to examine environmental investment decision-making of different occupational groups within a single industry.

2.1 Regulatory context of the Australian offshore petroleum industry

The Australian government (through the Environmental Protection Agency (EPA)) and the Australian Petroleum Production and Exploration Association (APPEA) set the regulatory rules and requirements in relation to undertaking environmental investment decisions in offshore petroleum exploration and production within the Australian jurisdiction (DITR, 2005). Of the existing Commonwealth legislation, there are three Acts which directly influence environmental investment decision-making. These are the: (1) Petroleum Submerged Land Act 1967; (2) Environment Protection and Biodiversity Conservation Act 1999; and (3) Corporations Act 2001. While the Petroleum Submerged Land Act 1967, at Clause 6 of Division 1, requires companies to minimise the environmental impact of their operations through investment in pollution prevention, the Environment Protection and Biodiversity Conservation Act 1999 mandates companies to undertake investment decision-making which effectively integrates both long and short term economic, environmental, social and ethical considerations. Similarly, section 1013D (1) of the Corporations Act 2001 requires firms to disclose the extent to which environmental, social and ethical considerations are taken into account in investment decision-making processes.

The industry also has self-regulatory arrangements administered by the relevant industry association that aim to regulate the behaviour of its members through a voluntary “Code of Environmental Practice” (the Code) launched in 1996. The development of the Code underlined the Australian offshore petroleum industry’s commitment to improve the environmental performance of its activities. The Code provides the framework for a program of continual improvement and leadership in environmental management within the Australian offshore petroleum industry. This Code is voluntary and the strength of it lies in that Australian offshore petroleum industry companies volunteer to commit, and can choose to implement the Code in a way that is appropriate to their operations (APPEA, 2006). According to the Code, APPEA member companies are required to measure their environmental performance as part of their Environment Management Systems

(EMS) (Sarker & Burritt, 2005). EMSs also require the implementation of an environmental management information system and management of environmental investment in emissions abatement activities (APPEA, 2003; Sarker & Burritt, 2005).

2.2 Environmental information strategies in the Australian offshore petroleum industry

APPEA's "Code of Environmental Practice" requires member companies to implement EMSs to separately account, audit and report the environmental impact caused at different stages of the life-cycle of the company's operations. Sarker & Burritt (2005) find that the implementation of EMSs by APPEA member companies has contributed to a reduction of 12 million tonnes of greenhouse gas emissions between 1996 and 2002. The EMSs consist of two environmental self-regulatory strategies: (1) greenhouse gas management strategies; and (2) greenhouse gas influence strategies (APPEA, 2005). While the greenhouse gas emissions management strategies emphasise the implementation of an environmental information system and investment in pollution abatement activities, the greenhouse gas influence strategies emphasise cleaner operations, as well as developing and supporting industry codes of practice that reduce greenhouse gas emissions as well as supporting research and development in greenhouse reduction technology (Sarker & Burritt, 2005).

3. Theory and hypotheses development

The existing literature on environmental investment decision-making research can be categorised into three broad groups. The first group of studies examines the effect of external regulatory factors that can influence individual ethical and environmental investment decision-making. These studies find that regulatory factors influence corporations to adopt environmentally friendly production and processes that may include investment in pollution control and management (see, e.g., Aoki & Coiffi, 1999; Christensen & Georg, 1995; Earnhart, 2004; Gunningham & Rees, 1997; Harrison, 2002; Newman & Bach, 2004; Yishai, 1998). The second group of studies examines the role of environmental information strategies and particularly the role of environmental accounting information on individual environmental investment decision-making. This group of studies finds that environmental information strategies and, in particular, environmentally-oriented accounting information, can play an important role to assist business managers with the efficient allocation of scarce resources by enabling management to discharge their accountability (see, e.g., Birkin, 2003; Burritt, Hann & Schaltegger, 2002; Burritt, 2004, 2005; Gray, 1996; Hutchinson, 1996; Larrinaga-Gonzalez & Bebbington, 2001; Milne, 1996; Otley, 2001; US EPA, 1996, 1997). The third group of studies examines the impact of both traditional enforcement and information based strategies in improving firms' environmental performance, and whether they can supplement or complement each other in influencing environmentally friendly investment decision-making (see, e.g., Aoki & Coiffi, 2000; Foulon, Lanoie & Laplante, 2002; Lai, Yang & Chang, 2003; US EPA, 1998). This group of studies finds that use of information strategies does create additional and strong incentives to improve firms' environmental performance.

The three hypotheses in this study are developed from institutional theory, legitimacy theory, self-justification theory and from prior research. Hypothesis 1 (regulatory influence hypothesis) is developed from institutional theory, which relates to whether government or industry regulatory climates affect environmental investment decision-making. Hypothesis 2 (information strategy hypothesis) is developed from legitimacy theory, which relates to whether the provision of conventional or voluntary environmental information and disclosure strategies affect environmental investment decision-making. Finally, Hypothesis 3 (interaction hypothesis) is developed from self-justification theory, which relates to whether the interaction of a firm's regulatory climate and information strategy affects environmental investment decision-making

3.1 Hypothesis 1 (Regulatory influence hypothesis)

Regulatory rules and legislation have a strong influence on the way corporate managers undertake environmentally friendly investment decision-making. Within the literature, there are two types of regulatory mechanisms considered most likely to influence corporate environmental management planning and practices:

government regulation and industry organisations (Gunningham & Rees, 1997; Harrison, 2002; Delmas & Toffel, 2004).

3.1.1 Government regulation

Government plays an important role to regulate corporate activities through coercive rules and legislation (Harrison, 2002). The institutionalist view of government regulation can be traced back to seventeenth century British Common Law (Trebing, 1987). Scholars of institutional theory argue that institutional forces, as exerted through government agencies, can shape the agents' (i.e., firm managers') behaviour to commit to and credibly implement regulatory schemes (Delmas & Heiman, 2001; Levy & Spiller, 1994; Weingast, 1995; Williamson, 1984). Consistent with other institutional theory studies, these studies find that constrained regulatory discretion is an important pre-condition for credible and stable regulatory schemes, which enforce business corporations to undertake investment in pollution control and management.

Government acts in the best interests of the broader public within society, and influences firms' activities through rules and legislation enforced by environmental protection agencies (EPAs) and other regulatory bodies. There are two different ways by which government can influence a company's environmental investment in pollution control and management. First, by insisting on the adoption of voluntary environmental strategies, government can send a clear signal to business corporations to undertake environmentally friendly production and processes that require investment in pollution control and management (Carraro, Katsoulacos & Xepapades, 1996). Second, government can facilitate the adoption of effective tools and techniques to assist business managers with environmentally friendly investment decision-making (Majumder & Marcus, 2001).

Literature on regulatory theories suggests that the government acts in the best interests of the broader public within society and influences firms' activities through rules and legislation via environmental protection agencies (EPAs) and other regulatory bodies. This relies on the public-interest view, which considers government as being composed of individuals motivated by a desire to serve the public by doing what is "right" (Gunningham, Kagan & Thornton, 2004).

3.1.2 Industry regulation

Industry organisations, as institutional actors, operate as a surrogate regulator by monitoring or policing the industry "codes of conduct" as a complement or alternative to government regulation (Gunningham & Rees, 1997). Industry organisations can play an important role by acting as a third party to motivate both the firm and government to adopt environmentally friendly production and processes (Gunningham, Grabosky & Sinclair, 1998; Gunningham & Sinclair, 1999). They can also play a mediating role between government and firms to establish a partnership in management.

Negotiated agreements can be concluded between the government (the regulator) and the firm (the regulatee). Industry organisations can help resolve conflicts between these two parties. Such a partnership between the government, industry organisation and the firm can encourage the formation of a flexible mode of environmental regulation that may influence business managers to adopt environmentally friendly processes and methods of production (Konar & Cohen, 1997; Majumdar & Marcus, 2001).

The above discussion acknowledges the role of institutional forces and their influence over business managers' choice of environmental strategy. Studies find that institutional pressures can cause variability in the environmental strategies of companies operating in similar social, regulatory and public policy contexts (e.g., Aragon-Correa, 1998; Hart & Ahuja, 1996; Russo & Fouts, 1997; Sharma & Vredenburg, 1998). Consistent with the above studies, Sharma & Vredenburg (1998) find that significant variability ranging from reactivity to pro-activity in environmental strategies for companies and its managers based on changes in the company's regulatory climate. Reactivity will arise in the face of a coercive government controlled regulatory climate, while pro-activity will arise in an industry controlled voluntary self-regulatory climate (May, 2003; Newman & Bach, 2004). In the case of managers' willingness to make environmental investments, this means, managers will act more proactively in a co-operative organisational regulatory climate than in a coercive regulatory organisational climate. From the above discussion, we propose the following hypotheses:

- Hypothesis 1a: Managers who work in an industry self-regulated climate are more likely to undertake environmental investment to avoid firms' future environmental risks than are managers who work in a government regulated climate.
- Hypothesis 1b: Managers who work in an industry self-regulated climate are more likely to undertake environmental investment in pollution prevention strategies than are managers who work in a government regulated climate.
- Hypothesis 1c: Managers who work in an industry self-regulated climate are more likely to incorporate environmental considerations into firms' new investment decisions than are managers who work in a government regulated climate.

3.2 Hypothesis 2 (Information strategy hypothesis)

Accounting information to assist with business planning and investment decision-making is a fundamental idea behind corporate environmental accounting (Schaltegger & Burritt, 2000). As environmental regulations for companies are increasing, managers are beginning to recognise the growing importance of incorporating the monetary consequences of corporate environmental impacts into business planning and investment decision-making (Burritt, 2004). The two types of accounting information companies use as a means to undertake corporate environmental management planning and practices are conventional accounting information, and environmental accounting information (Schaltegger, Burritt & Petersen, 2003).

3.2.1 Conventional accounting information

Conventional accounting provides separate information about monetary and physical aspects of the company's activities (Schaltegger, Burritt, & Petersen, 2003). It has a focus on internal decision-making about the business to internal decision-makers, such as managers, by providing information about the future (Otley, 2001) and as a basis for decision-making and management control (Burritt, 2005). A number of empirical studies examine the role of management accounting information in improving corporate sustainability and investment decision-making (e.g., Bennett & James, 1997; Burritt, 2004; Graff, Reiskin, White & Bidwell, 1998; Hamner & Stinson, 1995; IFAC, 2004; Reyes, 2000; Wycherley, 1997). These studies find that conventional management accounting largely ignores the separate identification, classification, measurement, and reporting of environmental information. Such an accounting system can be adapted to reflect environmental issues in a company's investment decision-making. A few case studies also examine the effectiveness of information and disclosure strategy on business planning and investment decision-making (e.g., Bennett & James, 1997; Gray, 1992; Hammer & Stinson, 1995; Milne, 1996). These studies suggest that there needs to be a more explicit and theoretical basis for the development of a new accounting for the social and environmental public interest. These studies suggest that because conventional management accounting fails to incorporate sustainability issues in decision-making, there needs to be a new accounting system that imports and responds to the pressing exigencies of sustainability.

The above discussion leads to the idea that there are potential benefits that can be derived from adjusting conventional accounting for environmental issues. The basic need for environmental issues to be incorporated in conventional management accounting is to ensure that there is an accounting for the financial impacts of environmentally induced activities, such as environmental protection and investment in cleaner production processes and products (Schaltegger & Burritt, 2000).

3.2.2 Environmental accounting information

Environmental accounting is defined as the management of environmental and economic performance through the development and implementation of appropriate environmental related accounting systems and practices (IFAC, 1998, Para 1). It includes the environmentally-induced financial aspects of accounting that can help managers to make decisions and be accountable for the outcome of their decisions (Schaltegger & Burritt, 2000). Environmental accounting can serve as a mechanism to identify and measure

the full spectrum of environmental costs of current production processes and the economic benefits of pollution prevention or cleaner processes, and to integrate these costs into a company's investment decision-making (UN DSD, 1999).

There are a number of case studies that examine the usefulness of environmental accounting information in investment appraisal and investment decision-making (see, e.g., Camino, 2001; Gray, Owen & Maunders, 1995; Karvonen, 2000; Wilmhurst & Frost, 2001; Wycherley, 1997). These studies find that environmental risk recognition, through the concepts and tools of environmental accounting, can play a potential role in incorporating environmental consideration in investment appraisal and business decision-making. As well as the above case studies, a few empirical studies examine the usefulness of environmental accounting information in investment appraisal and investment decision-making (Gray, Walters, Bebbington & Thomson, 1995; Karvonen, 2000). They posit that environmental accounting has the potential to help improve not only the environmental practices of a firm, but also help in drawing attention to places where cost-savings can be made.

Past studies have used legitimacy theory to explain a company's voluntary initiatives as a means to operate within society (Patten, 1992, 1991). Legitimacy theory relies on the belief that a firm operates as a part of the society and that it must legitimise its activities in order to continue to operate within that society (Suchman, 1995). Underlying legitimacy theory places an emphasis on the "social contract" that exists between the firm and the society within which the firm operates and consumes resources within the society (Gray, Own & Maunders, 1988; Patten, 1991, 1992; Shocker & Sethi, 1974). Deegan (2000, p.253) posits that:

"Legitimacy theory asserts that organisations continually seek to ensure that they operate within the bounds and norms of their respective societies, that is, they attempt to ensure that their activities are perceived by outside parties as being "legitimate". These bounds and norms are not considered to be fixed, but rather, change over time, thereby requiring the organisation to be responsive to the environment in which they operate".

The above discussion suggests that society has the right to know and evaluate the legitimacy of an organisation by considering how well it performs in terms of social norms, values and expectations (Deegan, 2000). Thus, to obtain societal approval and to continue to operate and grow, organisations need to perform well (Parsa & Kouhy, 2005). Consequently, if a company fails to operate within the boundaries set by the social norms, society may revoke its contract and may prevent it from continuing its operations, which could result in a legitimacy crisis for such organisation (Deegan & Rankin, 1996). Over recent times, environmental considerations have become increasingly accepted by society as a norm. This is not only reflected by the proliferation of government regulation relating to environmental protection, but also the growing awareness of issues such as climate change within broader society, and the changes in consumer behaviour and mainstream political discourse that reflect this. Legitimacy theory posits that a failure to take environmental considerations into account may revoke a company's social license to operate.

Legitimacy theory places an emphasis on societal approval for business activities as a means of organisational legitimacy to operate within a society based on a kind of social contract. Thus, legitimacy theory can provide a basis for examining the environmentally desirable investment decision-making by managers of business corporations by exploring the phenomena of how they incorporate social and environmental information into a company's environmental investment decision-making. In the phase of corporate strategy that has entered into the information age, now, more than ever, corporate decision-makers recognise the need for accurate, reliable, timely and accessible business information (Birkin, 2003; Karvonen, 2000; Synnestvedt, 2001; Wilmhurst & Frost, 2001). Under legitimacy theory, appropriate information strategies, and, in particular, the provision of environmental accounting information, are seen as a vital means to the move towards attaining organisational legitimacy (Rikhardsson, 2001). Thus, the provision of environmental accounting information could encourage corporate managers to make proactive environmental investment choices, and can be considered as a means to improve organisational legitimacy.

The above discussion suggests that, in order to legitimise business activities, corporate managers will take more interest in undertaking a company's environmental investment decision-making in a situation where the company adopts a voluntary environmental information strategy as opposed to a situation where the company adopts a conventional/no environmental information strategy. From the above discussion, we propose the following hypotheses:

- Hypothesis 2a: Managers in a company with a voluntary environmental information strategy are more likely to undertake environmental investment to avoid future environmental risks than are managers in a company with a conventional environmental information strategy.
- Hypothesis 2b: Managers in a company with a voluntary environmental information strategy are more likely to undertake environmental investment in pollution prevention strategies than are managers in a company with a conventional environmental information strategy.
- Hypothesis 2c: Managers in a company with a voluntary environmental information strategy are more likely to incorporate environmental considerations into firms' new investment decisions than are managers in a company with a conventional environmental information strategy.

3.3 Hypothesis 3 (Interaction hypothesis)

While government regulation and the provision of information both have an individual influence on a company's environmental investment decision-making, there have been some discussion of the possible interaction between the two, which may affect the decision-making process (see e.g. Aoki & Coiffi, 2000; Foulon, Lanoie & Laplante, 2002; Lai, Yang & Chang, 2003; US EPA, 1998). An interaction between a company's regulatory climate and its provision of information strategy can be explained by self-justification theory. Self-justification theory is typically applied to explain cognitive rationalisation (Staw & Ross, 1978). However, it could also be applied to situations in which decision-makers in an organisation are faced with varied level of decision alternatives (Rodgers & Housel, 2004). Self-justification theory posits that an individual possesses a potent need to restore the appearance of rationality to their own behaviour (Aronson, 1972). The theory predicts that an individual cognitively re-evaluates decision alternatives after an important choice (Vroom, 1964). The major theoretical contribution of a self-justification mechanism is that it proposes a form of retrospective, as opposed to prospective, rationality (Staw & Ross, 1978). Self-justification theory has been widely accepted as one of the most important reasons in explaining escalating commitment (e.g., Rubin & Brockner, 1975; Staw, 1976; Tegar, 1980), as well understanding the critical pathways of investment decision-making from a range of decision alternatives (Wilson & Zhang, 1997). Although self-justification theory has not been widely used to examine environmental investment decision-making, Wilson and Zhang (1997) find that, in an experimental decision context, the theory can provide a framework to explain an individual's decision choice. Rodgers & Housel (2004) provide a decision-makers' process diagram that clarifies the critical pathways for decision-making as shown in Figure 1.

As shown in Figure 1, the circles represent the theoretical constructs of regulation (r), information (i), judgement (j), and investment decision choice (d). In the first phase, regulation and information individually influence the judgement of a business manager in their investment strategy. In the second phase, both regulation and information affect the business manager's judgement in relation to their environment investment strategy. The double ended arrow connecting regulation and information represents this relationship. In the case of a company's environmental investment decision-making, a manager's judgement and rational choice will be influenced by the types of regulatory climates operated in. For instance, regulatory theory states that in a coercive government regulatory climate, a manager of a business organisation will only try to meet specific environmental norms and standards to avoid sanctions (Sinclair, 1997), and will accordingly be less likely to adopt any beyond compliance strategy such as environmental investment to avoid future environmental risks, that will otherwise has no incentive for them. However, in an industry self-regulatory climate that promotes responsible environmental management, a manager of a business organisation will be encouraged to adopt an environmentally friendly investment strategy by incorporating

environmental considerations into firms' new investment decisions (Altham & Guerin, 2003; Anton, Deltas & Khanna, 2004). Thus, it can be expected that managers will be more likely to undertake environmental investment in a flexible industry controlled self-regulatory climate, when the company adopts a voluntary environmental information strategy than in a government controlled coercive regulatory climate, when the company adopts a conventional environmental information strategy. This discussion leads to the proposition that the two variables may interact with each other in a way that will affect individual environmental investment decision-making. Accordingly, the following hypotheses are proposed:

- Hypothesis 3a: Managers in a company that has a voluntary environmental information strategy and operates in an industry self-regulatory climate are more likely to undertake environmental investment to avoid future environmental risks than are managers in a company that has a conventional environmental information strategy and operates in a government regulatory climate.
- Hypothesis 3b: Managers in a company that has a voluntary environmental information strategy and operates in an industry self-regulatory climate are more likely to undertake environmental investment in pollution prevention strategies than are managers in a company that has a conventional environmental information strategy and operates in a government regulatory climate.
- Hypothesis 3c: Managers in a company that has a voluntary environmental information strategy and operates in an industry self-regulatory climate are more likely to incorporate environmental considerations into firms' new investment decisions than are managers in a company that has a conventional environmental information strategy and operates in a government regulatory climate.

4. Research method

4.1 Overview of design

For this study, a fictitious company's investment decision-making scenario was used to examine the effects of regulation and information on environmental investment decision-making. The experiment was based on a 2 x 2 between-subjects design. The two independent variables in this study were: (1) "regulatory climate", which contrasted "a government controlled coercive regulatory climate" and "an industry controlled voluntary self-regulatory climate"; and (2) "environmental information strategy", which contrasted "the provision of a voluntary environmental information strategy" and "the provision of a conventional environmental information strategy".

4.1.1 Experimental materials

The experimental task involved a case based on the environmental investment scenario of a fictitious company, "XYZ Company Ltd's". After reading the case materials, participants were asked to indicate whether they would: (1) undertake environmental investments to avoid future environmental risks; (2) undertake environmental investments in pollution prevention strategies; and (3) incorporate environmental considerations in new investment decisions. Each case was divided into four parts. The first part presented background information about the decision task and the case materials. The second part comprised descriptions of the company's regulatory environment and its environmental information strategy. The third part elicited the responses used as the dependent variables of the study while the fourth part contained manipulation check questions and collected demographic information about the participants. As this study used human subjects, it was necessary to ensure that ethics approval was received before commencement of the experiment.

4.2 Background information and decision scenario

In the first part of the case materials, participants were asked to read an investment decision scenario that used the same content and wording for all the treatment groups. It included a brief description of the role of the participants in dealing with the scenario and background information about the hypothetical company used in the case materials. An excerpt from the first part of the case materials is shown below. The participants were randomly assigned to one of the four treatment groups to avoid systematic errors and ensure replicability. Early versions of the experimental materials were used in both a pre-test and a pilot test, and the content of the decision experiment was submitted to independent readers for checking before commencing the actual experiment.

Scenario: XYZ Company Ltd

"You have been identified as a manager of an oil and gas company operating in Australia. When answering the questions following the fictitious case outlined below, you should adopt an approach consistent with what you perceive to be the corporate culture and social standing of the company being a manager responsible for its operations and major environmental investment decisions.

Case: XYZ is an oil and gas exploration and production company operating in the offshore ABC basin in Australia. Its main exploration site is in close vicinity to a World Heritage site and is highly sensitive to the biodiversity and aquatic ecosystem. A recent survey has indicated a possibility of more than 200 billion barrels of oil reserves in this exploration site that will require about \$100 million in new investments as well as \$20 million additional spending on existing site rehabilitation including investments in low and no-carbon energy technologies and carbon sequestration."

4.3 Independent variables

In the second part of the case materials, the two independent variables were manipulated. Participants in each treatment group received different versions of the company's regulatory climate and environmental information strategy. For this part, the case materials in each treatment group contained two paragraphs – one describing the company's environmental information strategy and the other describing the regulatory climate that the company operated in. The descriptions used for the two versions of the company's environmental information strategy are presented in Appendix A.

The description for the provision of a "voluntary environmental information strategy" stated that the company adopted an environmental information and disclosure strategy and implemented effective monitoring activities to assess environmental performance at all stages of its operations including exploration, development, production and rehabilitation. In contrast, the description for the provision of a "conventional environmental information strategy" stated that the company did not adapt any environmental information and disclosure strategy that may provide directions to the managers to operate in a sustainable way through monitoring environmental effects or to assess environmental performance at all stages of exploration, development, production and rehabilitation. The descriptions used for the two versions of the regulatory climate that the company operated in are presented in Appendix B.

The description for the "Government controlled coercive regulatory climate" manipulation stated that the company was under a government regulatory climate and was facing mandatory regulatory requirements of the state government to set emission reduction targets and to undertake investment decisions that consider the environment and future environmental risk reduction. The description for the "Industry controlled voluntary self-regulatory climate" manipulation stated that the company was exposed to an industry self-regulatory climate that adheres with the voluntary "Principles of Conduct" set by the industry association.

4.4 Dependent variables

The participants were asked to provide their judgements about three statements: (1) “The company should undertake environmental investments to avoid future environmental risks”, (2) “The company should undertake environmental investments in pollution prevention strategies”, and (3) “The company should incorporate environmental considerations in new investment decisions”. The statements were consistent with the situations that firm managers often encounter when they consider a company’s environmental investment decisions. The statements captured data to assess the extent to which managers are willing to invest in a company’s pollution control and management under the above three circumstances, and were consistent with the hypotheses of the study. The statements and judgements of the respondents were measured using a six-point scale anchored by “Strongly disagree-1” and “Strongly agree-6”.

4.5 Manipulation checks and demographic information

The participants also responded to manipulation checks and demographic questions and signed a letter of consent to use their response in this research. The manipulation checks were used to examine whether the participants perceived manipulations as intended. The participants also responded to a number of demographic questions including age, gender, primary job focus, general work experience, domain job experience, mother language, and firm characteristics such as company’s primary location of operation, country of incorporation and area of operation. After completing the manipulation checks and demographic questions, the participants signed a letter of consent to use their response in this research.

4.6 Administration of the experiment

Managers from the Australian offshore petroleum industry agreed to participate in this study through their industry associate, the Australia Petroleum Production and Exploration Industry (APPEA), which endorsed this study by providing a “Letter of Support” to the managers of the APPEA member companies to encourage them to participate in the study. APPEA had 52 member companies at the time this experiment was conducted. Four companies were excluded because they had their head office outside Australia.

The experiment was administered in a single stage during a two week period, including a follow up of the procedure for a further two weeks. One randomly-selected version of the case materials was sent to participants by ordinary postal mail. A total of 172 managers were selected for this study. Participation was voluntary and no financial incentive was given for participation in the experiment. After two weeks, 57 responses were returned; a response rate of 33%. The follow up procedure involved 115 managers who didn’t respond within the first two week period. The follow up request elicited another 41 responses, which gave a response rate of 365% for the reminder group. In total, 98 responses were returned, which gave an overall response rate of 57%. There were 3 incomplete responses, and this resulted in 95 useable responses, a useable response rate of 55%. The participants are 95 professional managers employed in the Australian offshore petroleum industry. A summary of the participants’ characteristics is shown in Table 1.

5. Results

5.1 Descriptive statistics

Operations (36%) and Administration (27%) were the two largest occupational groups represented in this study. Other occupational groups included were Occupational Health, Safety & Environment (15%), Human Resources (7%), Technical consultants (6%), Finance and Accounting (4%), and Drilling (4%). More than one-third (40%) of the participants had work experience of 25 years or more. Just under two-thirds (63%) of the participants had environment-related work experience and more than half (58%) had investment-related work experience, both of which are important for an environmental investment decision task. English was the first language of most of the participants (95%). The 95 participants who completed the experiment represented a majority (87%) of APPEA member companies. The descriptive statistics for the companies are presented in Table 2.

More than two-thirds (66.7%) of the APPEA member companies represented in this study were located in Western Australia. The remaining companies (33.3%) were located in other States and the Northern Territory. Just under two-thirds (64.3%) of the companies represented in the study were incorporated in Australia. The remaining companies (35.7%) were incorporated in countries such as Canada, the UK, the Netherlands, Malaysia, USA, Japan and Indonesia. Most of the companies (73.8%) were involved in both exploration and production of oil and gas resources within Australia. Of the remainder, 14.3% were involved in exploration only and 4.8% were involved in production only. A further 7.1% of the companies not directly engaged in exploration and/or production, were providing legal and technical support for the exploration and production companies.

5.2 Method of data analyses

The initial method of analysing the data was through a two-way multivariate analysis of variance (MANOVA). This was followed by a series of analysis of variance (ANOVAs) used to investigate the effects of the two independent variables on each of the three dependent variables of this study. To further investigate the results of the ANOVAs, a Kruskal-Wallis test was used, which is a non-parametric analog of an ANOVA and is used to analyse data that do not necessarily meet the assumptions of normality. Prior to the hypotheses testing, manipulation checks were conducted to test the internal validity of the experiment. The results of the manipulation checks indicated that the participants perceived both manipulations as intended¹.

5.3 MANOVA

Before proceeding to the MANOVA, tests were conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, and multicollinearity. As shown in Table 3, no serious violations were noted¹.

As shown in Table 3, the regulatory climate manipulation had no significant effect on the combined dependent variables: $F(3, 91) = 1.391, p = .125$; Pillai's Trace² = .045; partial eta squared = .045. Information strategy had a significant effect on the combined dependent variables: $F(3, 91) = 3.442, p = .010$; Pillai's Trace = .104; partial eta squared = .104. The analysis revealed no significant interaction effect between the two independent variables on the combined dependent variables: $F(3, 91) = .126, p = .472$; Pillai's Trace = .004; partial eta squared = .004. When the results for the dependent variables were considered separately (see Table 4, Panel A), the differences to reach statistical significance using a Bonferroni adjusted alpha level of .020, were regulatory climate for managers' willingness to undertake environmental investment in a firm's pollution prevention strategies: $F(1, 91) = 3.858, p = .026$, partial eta squared = .041, and information strategy for managers' willingness to undertake environmental investment to avoid a firm's future environmental risks: $F(1, 91) = 8.476, p = .002$, partial eta squared = .085, and for managers' willingness to incorporate environmental considerations into a firm's new investment decisions: $F(1, 91) = 4.016, p = .024$, partial eta squared = .042. The analysis revealed no significant interaction effect between the two independent variables on any of the dependent variables of the study.

An inspection of the mean (sd) scores in Table 4, Panel B, indicates that for all dependent variables, the participants had slightly higher environmental investment willingness scores in a situation where the company had an existing voluntary environmental information strategy and was exposed to an industry self-regulatory climate than in a situation where the company had conventional/no environmental information strategy and was exposed to a government regulatory climate. To further investigate the main and interaction effects of the two independent variables on each of the dependent variables, three separate ANOVAs were performed. The results of the ANOVAs are presented in Table 5, Table 6 and Table 7 respectively.

¹ The Mahalanobis distance score is 1.249, which is much lower than the tabulated critical value of 16.27 for three dependent variables, thus satisfying the assumption of normality (Tabachnik & Fidell, 1996).

² The value of Pillai's Trace is preferred (as compared to Wilk's Lambda) considering the relatively small sample size and unequal n values observed for the different treatment groups used on the experiment.

5.4 Hypotheses 1a, 2a and 3a

Testing of the first set of hypotheses (Hypotheses 1a, 2a and 3a) assesses the main and interaction effects of a firm's regulatory climate and information strategy on managers' willingness to undertake environmental investment to avoid a firm's future environmental risks. Hypothesis 1a is related to the main effect of a firm's regulatory climate on managers' willingness to undertake environmental investment to avoid a firm's future environmental risks. As shown in Table 5, the ANOVA results yield no significant main effect for the regulatory climate manipulation ($F = .749, p = .194$) for making an investment decision with respect to avoiding future environmental risks. A Kruskal-Wallis test corroborates the results of the ANOVA. As shown in Table 5, the result of the Kruskal-Wallis test is not significant ($H = .013, p = .455$). Overall, Hypothesis 1a is not supported given that the results of the ANOVA and the Kruskal-Wallis test are not significant.

Hypothesis 2a is related to the main effect of a firm's information strategy on managers' willingness to undertake environmental investment to avoid a firm's future environmental risks. The ANOVA results (Table 5) shows a significant main effect for the information strategy manipulation ($F = 8.476, p = .002$), indicating that a firm's information strategy has a strong influence on how managers make investment decisions with respect to avoiding future environmental risks. A Kruskal-Wallis test corroborates the results of the ANOVA. The result of the Kruskal-Wallis test shown in Table 5, indicate that the influence of information strategy was significant ($H = 6.939, p = .004$). Overall, Hypothesis 2a is supported given that the results of the ANOVA and the Kruskal-Wallis test are significant. Support for Hypothesis 2a provides evidence that information strategy has a significant effect on managers' environmental investment decisions to avoid future environmental risks.

Hypothesis 3a is related to the interaction effect between a firm's regulatory climate and information strategy on managers' willingness to undertake environmental investment to avoid a firm's future environmental risks. As shown in Table 5, the ANOVA results show no significant interaction effect ($F = .079, p = .389$) on managers' willingness to make environmental investment decisions to avoid future environmental risks. As for Hypotheses 1a and 2a, a Kruskal-Wallis test shows no significant interaction effect ($H = .095, p = .379$) between the two independent variables on managers' willingness to make environmental investment decisions to avoid future environmental risks. Overall, Hypothesis 3a is not supported given that the results of the ANOVA and the Kruskal-Wallis test are not significant.

5.5 Hypotheses 1b, 2b and 3b

Hypothesis 1b is related to the main effect of a firm's regulatory climate on managers' willingness to undertake environmental investment in a firm's pollution prevention strategies. The ANOVA results (Table 6) show a marginally significant main effect for the regulatory climate ($F = 3.858, p = .026$) on managers' willingness to undertake an investment decision with respect to adopting pollution prevention strategies. A Kruskal-Wallis test corroborates the results of the ANOVA. As shown in Table 6, the result of the Kruskal-Wallis test for regulatory climate manipulation is significant ($H = 3.039, p = .041$). Overall, Hypothesis 1b is supported given that the results of the ANOVA and Kruskal-Wallis test are significant. Support for Hypotheses 1b provides evidence that a firm's regulatory climate has an influence on how managers make environmental investment decisions with respect to adopting pollution prevention strategies.

Hypothesis 2b is related to the main effect of a firm's information strategy on managers' willingness to undertake environmental investment in a firm's pollution prevention strategies. The ANOVA results (Table 6) show no significant main effect for the information strategy manipulation ($F = 1.230, p = .135$). A Kruskal-Wallis test corroborates the ANOVA results. As shown in Table 6, the result of the Kruskal-Wallis test for information strategy is not significant ($H = .554, p = .228$). Hypothesis 2b is not supported given that the results of the ANOVA and the Kruskal-Wallis test are not significant.

Hypothesis 3b is related to the interaction effect between a firm's regulatory climate and information strategy on managers' willingness to undertake environmental investment in a firm's pollution prevention strategies. As shown in Table 6, the results of the ANOVA show no significant interaction effect ($F = .128, p = .361$) on managers' willingness to make an investment decision with respect to adopting pollution prevention strategies. A Kruskal Wallis test shows no significant interaction effect ($H = .381, p = .268$).

between the two independent variables on managers' willingness to make an investment decision with respect to adopting pollution prevention strategies. Hypothesis 3b is not supported, given that the results of the ANOVA and the Kruskal-Wallis test are not significant.

5.6 Hypotheses 1c, 2c and 3c

Hypothesis 1c is related to the main effect of a firm's regulatory climate on managers' willingness to incorporate environmental considerations into a firm's new investment decisions. As shown in Table 7, the ANOVA results yields no significant effect for regulatory climate ($F = 1.276$, $p = .131$) on managers' willingness to incorporate environmental considerations in new investment decisions. A Kruskal-Wallis test is used to verify the ANOVA results. As shown in Table 7, the result of the Kruskal-Wallis test is not significant ($H = .526$, $p = .234$). Overall, Hypothesis 1c is not supported given that the results of the ANOVA and the Kruskal-Wallis test are not significant.

Hypothesis 2c is related to the main effect of a firm's information strategy on managers' willingness to incorporate environmental considerations into a firm's new investment decisions. The ANOVA results (Table 7) show a significant main effect for information strategy ($F = 4.016$, $p = .024$), indicating that a firm's information strategy has a strong effect on managers' willingness to incorporate environmental considerations in new investment decisions. A Kruskal-Wallis test validates the ANOVA results. It shows that the effect of information strategy is significant ($H = 5.546$, $p = .009$). Hypothesis 2c is supported since the results of the ANOVA and the Kruskal Wallis test are significant.

Hypothesis 3c is related to the interaction effect between a firm's regulatory climate and information strategy on managers' willingness to incorporate environmental considerations into a firm's new investment decisions. As shown in Table 7, the results of the ANOVA show no significant interaction effect ($F = .096$, $p = .378$) between the two independent variables on managers' willingness to incorporate environmental considerations into new investment decisions. Similar to Hypotheses 1c and 2c, a Kruskal-Wallis test shows no significant interactive effect ($H = 1.131$, $p = .114$) between the two independent variables on managers to incorporate environmental considerations into new investment decisions. Overall, Hypothesis 3c is not supported given that the results of the ANOVA and the Kruskal Wallis test is not significant.

In summary, the results of MANOVA show a significant main effect for the regulatory climate on managers' willingness to make environmental investments in a company's pollution prevention strategies. Significant main effects for information strategy are obtained for managers' willingness to make environmental investments to avoid the company's future environmental risks, and for managers' willingness to incorporate environmental considerations into a company's new investment decisions. The results reveal no significant interaction effect between the two independent variables on the dependent variables. The findings indicate that regulatory climate has a significant effect on managers' willingness to make environmental investments about a company's ongoing or mundane pollution prevention strategies. On the other hand, information strategy has a strong effect on a managers' willingness to make long-term environmental investment decisions. In particular, information strategy has strong influence on managers to make investments to avoid future environmental risks and to incorporate environmental considerations into a company's new investment decisions. However, contrary to the findings of Foulon, Lanoie & Laplante (2002), the two variables have no significant interaction effects that influence managers' willingness to make environmental investments about a company's pollution control and management.

5.6.1 Summary of the findings

Generally, the ANOVA results are not very supportive of the hypotheses. Out of Hypotheses 1a, 2a and 3a, only Hypothesis 2a is supported, which asserts that managers who work in a company that has an existing voluntary environmental information strategy are more likely to undertake environmental investment to avoid future environmental risks than are managers who work in a company with no environmental information strategy. This result is consistent with some of the literature discussed previously which suggests that a voluntary environmental information strategy encourages managers to make socially and

environmentally desirable investment decisions and encourages them to adopt pollution prevention strategies that improve a firm's environmental performance (Brown & Deegan, 1998; Gray, Owen & Maunders, 1988; Guthrie & Parker, 1989; Patten, 1991, 1992).

Of Hypotheses 1b, 2b and 3b, strong support is only obtained for Hypothesis 1b, which asserts that managers in an industry self-regulatory climate are more likely to undertake environmental investment in pollution prevention strategies than managers in a government regulatory climate. This result is consistent with the findings of previous studies, which suggests that regulatory pressures can cause variability in the environmental strategies adopted by managers (Aragon-Correa, 1998; Hart & Ahuja, 1996; Sharma & Vredenburg, 1998), and that a voluntary self-regulatory climate is more supportive than a government regulatory climate for managers to make socially and environmentally desirable investment decisions (May, 2003; Newman & Bach, 2004).

Of Hypotheses 1c, 2c and 3c, only strong support for Hypothesis 2c is obtained, which asserts that managers in a company with a voluntary environmental information strategy are more likely to incorporate environmental considerations into new investment decisions than are managers in a company with no environmental information strategy. This is consistent with the findings of previous studies which suggests that managers are increasingly interested in voluntarily incorporating monetary consequences of corporate environmental impacts into investment appraisal and decision-making (Burritt, 2004, 2005; Gonzalez & Bebbington, 2001; Gray, 1996; Hutchinson, 1996; Otley, 2001). Overall, the findings provide empirical evidence of the effect of regulatory climate and information strategy on managers' decisions about a company's environmental investments.

6. Conclusions

The findings of our study show that a firm's regulatory climate strongly influences the way managers make environmental investment decisions about a company's ongoing pollution prevention strategies. This result is consistent with the findings of previous studies that suggest that regulatory discretion influences the behaviour of business managers to commit and credibly comply with regulatory schemes, and that voluntary regulatory schemes encourage managers of business corporations to invest in a company's pollution prevention control and management (e.g. Delmas & Heiman, 2001; Levy & Spiller, 1994; Weingast, 1995; Williamson, 1984). The findings also highlight that the type of information strategy adopted will have a strong influence on the way managers make environmental investment decisions to lessen a company's future environmental risks. In addition, information strategies influence managers when deciding how to incorporate environmental considerations into a company's new investment decisions. The results, which are consistent with the findings of previous studies, provide a case for the potential role that environmental information strategies can play in making a company's environmental investment decisions (e.g. Birkin, 2003; Burritt, Hann & Schaltegger, 2002; Burritt, 2005; Gray, 1996; Hutchinson, 1996; Larrinaga-Gonzalez & Bebbington, 2001; Milne, 1996; US EPA, 1996, 1997). However, contrary to expectations, the findings reveal no significant interaction effect between the two independent variables that impacted individual environmental investment decision-making. This is contrary to the findings of Foulon, Lanoie & Laplante (2002), which report that the two variables have an interaction effect that influence managers to make environmental investments about a company's pollution control and management. While Foulon, Lanoie & Laplante (2002) was conducted in a different regulatory and industry context (i.e. Canadian pulp and paper industry), the different findings reported in the present study could be due to the fact that the country-specific regulatory Acts and legislation and the type of industry have an impact on how managers make investment decisions regarding pollution reduction strategies relating to a company's pollution control and management. Because the present study is not designed to reach conclusions on the regulatory impact on environmental investment decision-making across different countries and industry sectors, this is an avenue that could be pursued by future research.

The findings of our study have implications for a number of groups. The largest group of beneficiaries from this research are policy-makers, and particularly, regulatory groups. Designing the correct regulatory

policy for environmental protection is an increasingly important but rather difficult task. There are strong incentives for policy-makers to find an effective regulatory mechanism that can improve the environmental performance of particular facilities (Earnhart, 2004; Harrison & Antweiler, 2003). The increasing interest of policy-makers has been fostered by substantial discussion in the disciplines that underpin or are related to regulatory research (e.g., Aalders & Wilthagen, 1997; Braithwaite, 2002; Gunningham & Sinclair, 1999). However, there are many competing viewpoints. Consistent with the words of Sinclair (1997, p.530), "the regulatory dichotomy has infused the policy debate, with commentators raising a number of threshold issues that reflect the purported strength and weaknesses of one approach or another". Similarly, research into designing an effective regulatory policy alternative (or mix) that could influence a company's pollution prevention strategy is subject to much debate (Gunningham & Sinclair, 1999).

One implication of the findings of our study is that, for both government and private industry, regulatory policy has more than just legislative relevance. It may also comprise a behavioural component that may pose significant variability from reactivity to pro-activity for managers when they make a company's investment decisions. As such, their decisions may vary depending on the nature of the regulatory climate in which they operate. Reactivity will arise in the face of a coercive government regulatory climate, while pro-activity will arise in a flexible and voluntary industry self-regulatory climate. Given this contention, adopting a purely coercive regulatory approach to pollution control (such as enforcing regulatory Acts and legislation which promotes environmental investments) may be ineffective. This is important for policy-makers wishing to promote the adoption of voluntary pollution prevention strategies for larger and capital-intensive business operations, such as in mineral and petroleum industries.

Our study has a number of limitations that should be considered when evaluating the findings of this research. First, the study is limited by its scope as it has only been undertaken in a single industry sector. As environmental legislation is different for different countries, the results of this study should be considered with caution when generalising the findings in a different regulatory context. Second, the study had limitations in design as it used a single research method of experimentation. Decision experiments, by their very nature, are limited to measuring changes of behaviour under controlled and hypothetical situations. The extent to which such behaviour would be replicated in the real world is open to debate. The limitations of our study suggest a number of possible directions for further research. First, to counteract the problem of generalising the results obtained, further studies could be replicated in other polluting industries (e.g., chemical, pulp and paper, and mining industries). Considerations could also be given in replicating the study in other geographical and socio-political contexts as a basis for assessing cross-country generalisation. Second, to overcome the limitations in design of this study, future studies may use multi-method approaches or triangulation as research methodologies. Third, this study is based on a 2 x 2 between-subjects design, which provides only four cells or treatment groups available for investigation. The two variables included are the external social control variable, such as the regulatory climate, and the internal business management variable, such as information strategy. However, there are a number of other social control variables, for instance, economic instruments and subsidies that can influence the investment decision-making process (Wood & Ross, 2006). Future studies might include other social control variables into a single design that could improve the quality of the research. Fourth, consideration could be given to an examination of alternative theories to this research, for instance, deterrence theory, stakeholder theory and/or theory of planned behaviour. These alternative theories could be examined either independently or jointly so as to enable a comparison of the explanatory power of each of these theories.

Ethical and environmental investment decision-making is a popular topic, yet contentious at the same time because, to date, there is no clear agreement as to what factors influence the individual environmental investment decision-making process. Our study has shed some light on this issue by examining the influence of two important factors on individual environmental investment decision-making. Our study illustrates the breadth of research taking place in connection with ethical and environmental investment decision-making, and the variety of perspectives that have relevance to the topic. While the conflicting results from prior research emphasise the need for further replications of these factors influencing individual

environmental investment decision-making, the directions for future research indicate that this study might provide useful insight in this challenging and complex area of research.

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Vitae

Tapan K. Sarker

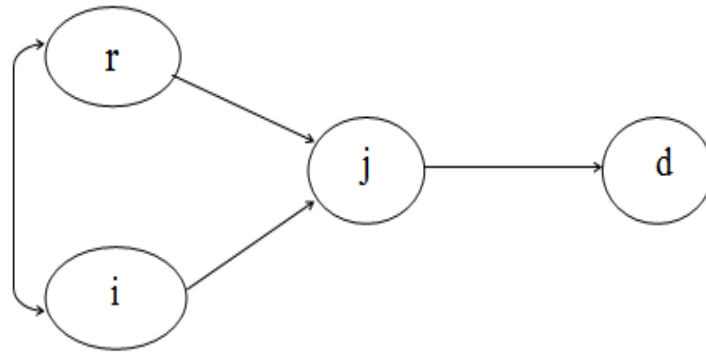
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Figure

Figure 1. Decision-makers' Processes Diagram



[Where, r = regulation; i = information; j = judgement; d = decision choice]

Source: Adapted from Rodgers & Housel (2004)

Appendixes

Appendix A. Description of environmental information strategy manipulations

Environmental information strategy	Description in the experimental materials
Voluntary environmental information strategy	The company has been operating very profitably in recent years and has shown satisfactory environmental performance in its operations. To achieve the current level of environmental performance, the company has adopted voluntary environmental information and disclosure strategies that provide directions to the managers to operate in a sustainable way through monitoring environmental effects and to assess environmental performance at all stages of exploration, development, production and rehabilitation. The company communicates openly with government, the industry association, NGOs and the public in a timely manner on environmental issues that relate to its operations. The company has also undertaken considerable investments in protecting the natural environment in the exploration site. The company is highly concerned about possible penalties and litigation costs that may result from non-compliance with government regulations and has taken initiatives to meet all environmental, health and safety requirements and to train staff and employees about environment friendly exploration practices.
Conventional environmental information strategy	The company has been operating very profitably in recent years however; it has shown very poor environmental performance in its operations. To achieve the expected level of environmental performance, the company has no immediate plan to adopt any environmental information and disclosure strategy that may provide directions to the managers to operate in a sustainable way through monitoring environmental effects or to assess environmental performance at all stages of exploration, development, production and rehabilitation. The company rarely communicates with government, the industry association, NGOs or the public on environmental issues that relate to its operations. The company is not undertaking any investments in protecting the natural environment and ignores the possible penalties and litigation costs that may result from non-compliance with government regulations and has taken no initiatives to meet environmental, health and safety requirements or to train staff and employees about environment friendly exploration practice.

Appendix B. Description of regulatory climate manipulations

Regulatory climate	Description in the experimental materials
Government controlled coercive regulatory climate	A recent 'Biodiversity and Aquatic Ecosystem Conservation Act' enacted by the state government where the company operates provides strict guidelines to all offshore oil and gas exploration companies to operate in a way that ensures improved environmental performance through biodiversity conservation as well as sufficient health and safety measures in their operations. All companies operating in the ABC basin area now have to account for possible environmental consequences for the entire life cycle of their operations. Companies have to disclose their operational greenhouse gas emissions including the environmental impact of all other activities through the adoption of environmental reporting practices; a mandatory measure to be taken at each step in the exploration, production and rehabilitation cycle. The new Act mandates all companies to set absolute greenhouse gas emission goals and reduction targets to incorporate into their environmental management plan. Companies that do not comply with the new regulation will be heavily penalised.
Industry controlled voluntary self-regulatory climate	The company is a member of 'The Australian Petroleum Production and Exploration Association', namely APPEA, that aims to promote an efficient and competitive Australian petroleum resource industry which can operate to the highest safety and environmental standards. Recently APPEA has provided 'Principles of Conduct' to its member companies which incorporate voluntary self-regulation through the formulation and acceptance of codes of practice in the key areas of business activity including occupational health, safety, environmental and community risk management. According to the new 'Principles of Conduct' all APPEA member companies have agreed to communicate and explain the environmental impacts of their activities to the industry, regulators, and to the communities in which they operate. Companies are encouraged voluntarily to adopt environmental information and disclosure strategies that can provide directions to the managers to operate in an ethical and responsible business practices through an open and effective engagement with the communities, industry association, regulators and other member companies.

Table 1: Summary of sample participants' characteristics (N = 95)

Gender	%	Age (Years)	%	Main job focus	%	Years of general work experience (Years)	%	Environment-related work experience		Investment-related work experience		English as their first language	
Males	89.5%	<25	1.1%	Operations	35.8%	<5	5.3%	Yes	63.2%	Yes	57.9%	Yes	94.7%
Females	10.5%	25-34	14.7%	Admin	27.3%	5-9	8.4%	No	36.8%	No	42.1%	No	5.3%
		35-44	29.4%	OHSE	14.8%	10-14	14.7%						
		45-54	43.2%	HR	7.4%	15-19	12.7%						
		55>	11.6%	Technical Consultant	6.3%	20-24	18.9%						
				Finance	4.2%	25>	40.0%						
				Drilling	4.2%								

Table 2: Descriptive statistics of companies (N = 42)

State	%	Areas of operation	%	Country of incorporation	%
WA	66.7%	Exploration only	14.3%	Australia	64.3%
VIC	9.5%	Production only	4.8%	Overseas	35.7%
QLD	7.2%	Both exploration and production	73.8%		
SA	7.2%	Other (legal/technical support)	7.1%		
NT	4.8%				
NSW	2.3%				
TAS	2.3%				
Total	100%		100%		100%

Table 3: Multivariate tests

Effect ^a		Value	F	Hypotheses df	Error df	Sig.*
Intercept	Pillai's Trace	.986	2227.485	3.000	89.000	.000
	Wilks' Lambda	.013	2227.485	3.000	89.000	.000
	Hottelling's Trace	75.08	2227.485	3.000	89.000	.000
	Roy's Largest Root	75.08	2227.485	3.000	89.000	.000
Main effect: Regulatory Climate	Pillai's Trace	.045	1.391	3.000	89.000	.125
	Wilks' Lambda	.955	1.391	3.000	89.000	.125
	Hottelling's Trace	.047	1.391	3.000	89.000	.125
	Roy's Largest Root	.047	1.391	3.000	89.000	.125
Main effect: Information Strategy	Pillai's Trace	.104	3.442	3.000	89.000	.010
	Wilks' Lambda	.896	3.442	3.000	89.000	.010
	Hottelling's Trace	.116	3.442	3.000	89.000	.010
	Roy's Largest Root	.116	3.442	3.000	89.000	.010
Interaction: Regulatory Climate x Information Strategy	Pillai's Trace	.004	.126	3.000	89.000	.472
	Wilks' Lambda	.996	.126	3.000	89.000	.472
	Hottelling's Trace	.004	.126	3.000	89.000	.472
	Roy's Largest Root	.004	.126	3.000	89.000	.472

^a Design: Intercept + Regulatory Climate + Information Strategy + Regulatory Climate x Information Strategy. * One tailed.

Table 4. Multivariate Analysis of Variance (MANOVA) Results

Panel A: Tests of Between-Subjects Effects

Sources of Variation	SS	df	MS	F	Sig.*
Main effects					
(a) Regulatory Climate					
Managers' willingness to undertake environmental investment to avoid a firm's future environmental risks (DV1)	.627	1	.627	.749	.194
Managers' willingness to undertake environmental investment in a firm's pollution prevention strategies (DV2)	2.053	1	2.053	3.858	.026
Managers' willingness to incorporate environmental considerations into a firm's new investment decisions (DV3)	.958	1	.958	1.276	.131
(b) Information Strategy					
Managers' willingness to undertake environmental investment to avoid a firm's future environmental risks (DV1)	.627	1	.627	8.476	.002
Managers' willingness to undertake environmental investment in a firm's pollution prevention strategies (DV2)	2.053	1	2.053	1.230	.135
Managers' willingness to incorporate environmental considerations into a firm's new investment decisions (DV3)	.958	1	.958	4.016	.024
Interaction					
(c) Regulatory Climate x Information Strategy					
Managers' willingness to undertake environmental investment to avoid a firm's future environmental risks (DV1)	.066	1	.066	.079	.389
Managers' willingness to undertake environmental investment in a firm's pollution prevention strategies (DV2)	.068	1	.068	.128	.361
Managers' willingness to incorporate environmental considerations into a firm's new investment decisions (DV3)	.072	1	.072	.096	.378
Error					
Managers' willingness to undertake environmental investment to avoid a firm's future environmental risks (DV1)	76.154	91	.837		
Managers' willingness to undertake environmental investment in a firm's pollution prevention strategies (DV2)	48.420	91	.532		
Managers' willingness to incorporate environmental considerations into a firm's new investment decisions (DV3)	68.301	91	.751		

* One tailed

Panel B: Mean (sd)

Dependent Variables(DVs) ^a	Regulatory Climate	Information Strategy	
		Voluntary environmental information strategy	Conventional environmental information strategy
Managers' willingness to undertake environmental investment to avoid a firm's future environmental risks (DV1)	Government regulatory climate	Cell 1 5.22 (.751) ^b n =27	Cell 2 4.62 (1.299) n=26
	Industry self-regulatory climate	Cell 4 5.33 (.485) n =18	Cell 3 4.83 (.816) n = 24
Managers' willingness to undertake environmental investment in a firm's pollution prevention strategies (DV2)	Government regulatory climate	Cell 1 5.04 (.759) n =27	Cell 2 4.92 (.796) n=26
	Industry self-regulatory climate	Cell 4 5.39 (.502) n =18	Cell 3 5.17 (.761) n= 24
Managers' willingness to incorporate environmental considerations into a firm's new investment decisions (DV3)	Government regulatory climate	Cell 1 5.07 (1.035) n=27	Cell 2 4.77 (.863) n =26
	Industry self-regulatory climate	Cell 4 5.33 (.594) n =18	Cell 3 4.92 (.830) n = 24

^a. The dependent variables are measured using a six-point scale where 1 = "Strongly disagree", 6 = "Strongly agree".

^b. Values enclosed in parentheses represent the standard deviation.

ANOVAs

Table 5. DV1: Managers' willingness to undertake environmental investment to avoid a firm's future environmental risks (Hypotheses 1a, 2a, and 3a)

Sources of Variation	ANOVA Results					Kruskal-Wallis Results		
	SS	df	MS	F	Sig.*	H	df	Sig.*
Main Effects								
Regulatory Climate	.627	1	.627	.749	.194	.013	1	.455
Information Strategy	7.093	1	7.093	8.476	.002	6.939	1	.004
Interaction								
Regulatory Climate x Information Strategy	.066	1	.066	.079	.389	.095	1	.379
Error	76.154	91	.837					
Corrected Total	83.958	94						

*One tailed

Table 6. DV2: Managers' willingness to undertake environmental investment in a firm's pollution prevention strategies (Hypotheses 1b, 2b and 3b)

Sources of Variation	ANOVA Results					Kruskal-Wallis Results		
	SS	df	MS	F	Sig.*	H	df	Sig.*
Main Effects								
Regulatory Climate	2.053	1	2.053	3.858	.026	3.039	1	.041
Information Strategy	.654	1	.654	1.230	.135	.554	1	.228
Interaction								
Regulatory Climate x Information Strategy	.068	1	.068	.128	.361	.268	1	.268
Error	48.420	91	.532					
Corrected Total	50.947	94						

* One tailed

Table 7. DV3: Managers' willingness to incorporate environmental considerations into a firm's new investment decisions (Hypotheses 1c, 2c and 3c)

Sources of Variation	ANOVA Results					Kruskal-Wallis Results		
	SS	df	MS	F	Sig.*	H	df	Sig.*
Main Effects								
Regulatory Climate	.958	1	.958	1.276	.131	.526	1	.234
Information Strategy	3.014	1	3.014	4.016	.024	5.546	1	.009
Interaction								
Regulatory Climate x Information Strategy	.072	1	.072	.096	.378	1.131	1	.114
Error	68.301	91	.751					
Corrected Total	72.000	94						

* One tailed