Chapter 1

Introduction

1.1 Introduction and Chapter Overview

Capital investment decisions must rank as one of the most important forms of decisions made in our economic society: in aggregate across different sectors of the economy they account for a large proportion of the natural resources and set the course of activities for the next generation. To the individual enterprise, whether public or private, the success of these decisions will affect its very survival and future prosperity (Butler, Davies, Pike and Sharp, 1993, p.49).

The importance of capital investment decisions to the success of the firm and to improved environmental performance has caused environmental protection authorities/agencies (EPAs) around the world to direct attention to them. In particular, the EPA (USA) has funded a number of studies on environmental costing and capital investments (viz., White et al, 1995; Shields, Beloff and Heller, 1997; Boyd, 1998). Although some studies have examined the influence of individual social controls on the environmental performance of the firm (Australia and New Zealand Environment and Conservation Council [ANZECC], 1998), the relative importance of these measures and interrelationships between them remains untested. As well, there has been little research into their influence on the capital investment decision.

This thesis presents empirical research into the influence of environmental social controls on the capital investment decision-making of Australian firms. In this thesis the term “capital investment decision-making” means the process of developing a firm’s planned capital investments. It typically entails comparing predicted cost and revenue streams of current operations and alternative investment projects against financial benchmarks in light of the costs of capital to the firm (White and Becker, 1992). The terms “capital investment” and “capital budgeting” (as used in this thesis) are synonymous.
The environmental social controls\(^1\) selected for study in this thesis are:

(i) Mandatory disclosure about environmental performance;
(ii) Regulatory costs such as pollution charges and mandatory clean-up costs;
(iii) Subsidisation of environmental capital expenditure; and
(iv) Stakeholder opinion.

These variables are posited to have a socially beneficial effect, imposing various costs and benefits which drive the firm towards investment in less polluting capital equipment. They may be viewed as “carrots” such as financial benefits from subsidisation, better reputation, and increased market share for good environmental performance; and “sticks” such as fines and penalties, poor reputation, and loss of market share for poor environmental performance.

There are two main forms of social control. The first is direct regulatory intervention by government agencies. The government regulatory aspect of social control is investigated through the regulation, subsidisation and mandatory environmental disclosure variables. The other important aspect of social control is the social expectation through which the firm is held accountable for its environmental performance. This second, more informal means of control acts largely through market forces which impose financial and/or reputational penalties or rewards based on the firm's environmental performance. In this study this moral suasion factor is termed “stakeholder opinion.”

The boundary between government regulation and market forces is becoming increasingly blurred with the introduction of economic instruments which act on market forces. Little is

\(^1\) Definitions of the four selected social controls are given in section 1.8
known of the extent to which these social controls are effective in influencing firms toward less polluting capital investment. To overcome this deficit in our knowledge a model is proposed to examine the actions and interactions between the four social controls in influencing the capital investment decision. The model (shown in Figure 1.1, p.25) sets out the relationships to be tested including:

(i) The influence of mandatory environmental reporting, regulation, subsidisation, and stakeholder opinion on capital investment decision-making measured in terms of overall acceptability of the capital investment decision.

(ii) The moderating influence of firm size and industry type.

The chapter is organised in the following manner: section 1.2 sets out the social context and historical development of the relationship between business and the environment; section 1.3 describes the environmental business literature and points out the ‘gap’ in the literature which is filled by this study; section 1.4 sets out the theoretical stance used in the thesis; section 1.5 provides a model for the research on the relationship between environmental social controls and the firm’s capital investment decision-making and includes the influence of firm size, industry type and individual manager disposition towards the environment; section 1.6 sets out the statement of purpose and significance of the study; the research methodology is presented in section 1.7; in section 1.8 key terms relevant to the thesis are defined; assumptions and limitations of the study are stated in section 1.9 and an overview of the remainder of the thesis concludes the chapter in section 1.10.
1.2 The Social Context of the Study

Social controls are described as “pressures” by Williams (1999). Direct pressures are those of legislation or regulation. However, “[t]here is also a range of pressures that are marginally short of legislation but almost equally effective” (Williams, 1999, p.65). This includes “better environmental reporting by companies, again under threat of legislation if a solution is not voluntarily found which is acceptable to the government”. Indirect pressures arise from public opinion (customer opinion) and also from banks and insurance companies. Williams notes (p.65) that “[b]anks become reluctant to regard old, possibly polluted sites as valuable assets, insurance companies start to re-assess public liability and employee liability risks”.

The difficulties companies face in dealing with these (often conflicting) pressures are illustrated in the following quotations:

I know we are not sustainable – but what the hell do I tell my fellow directors and my shareholders? Should we shut up shop? That may be the right answer but it isn’t going to be accepted you know! (Director of a multinational chemical company, cited in Gray, Walters, Bebbington and Thompson, 1995, p.228).

Even with a broader based and more appropriate information system, are businesses capable of the perhaps necessary self-imposed sacrifices for future generations? Some argue that business has for too long been permitted to make these kinds of judgements on behalf of communities, and by doing so inappropriately, is part of the problem (Milne, 1996).

In the past, much of the cost of pollution and other environmental damage has been borne by society. Now social expectations and the change to ‘user pays’ environmental regulations means firms must internalise some of this cost.
Mindful of the foregoing, this section provides an overview of the social context in which we find ourselves and the historical development of environmental concerns by society. It enlarges our view of this situation by describing in section 1.2.1 changing social expectations about the environmental performance of business. Following from this, section 1.2.2 reviews the movement towards voluntarism associated with the use of economic instruments as a replacement for ‘command and control’ regulation. Finally section 1.2.3 focuses on the Australian situation, particularly examining the approach to environmental disclosure and regulation.

1.2.1 The Need to Align the Goals of Business and Society

The Brundtland Report (1987) brought the concept of "ecologically sustainable development" to the attention of the world. Common property resources such as air and water have been freely used. Business has made use of these resources without internalising the cost. Epstein (1996, p.2) cites a statement in the Brundtland Report (1987):

What is needed now is a new era of economic growth - growth that is forceful and at the same time socially and environmentally sustainable. Unless we are able to translate our words into a language that can reach the hearts and minds of people young and old, we shall not be able to undertake the extensive social changes needed to correct the course of development.

Gro Harlem Brundtland, Prime Minister of Norway
Chairman - United Nations World Commission
on Environment and Development

Epstein (1996, p.2) points out that business leaders need a way to think about environmental impacts and incorporate them into decision-making. To do this calls for the use of a language that is commonly used in business - the language of dollars.
He notes (p.2) that:

Managers need to be able to measure and report corporate environmental impacts and integrate those impacts into decisions on product costing, product pricing, capital investment, product design and performance evaluations.

These quotations illustrate the difficulties which have arisen from the evolution of an economic system lacking in comprehension of the finite nature of ecological resources. Fuchs and Mazmanian (1998, p.194) discussing the focus on sustainability in environmental business literature, point out that “while sustainability should be the ultimate goal – any improvement in the environmental performance of business is desirable.” They consider that (p.193):

...identifying the causes of greening that policy makers can manipulate and the types of greening that lead to economic growth, would allow policy makers to effectively maximise environmental and economic welfare. By choosing a policy measure with the purpose of achieving a particular form of greening which will also spur economic growth, policy makers do indeed face the much belaboured win-win situation.

If sustainability is an achievable goal, the first step towards that goal is to harmonise the objectives of business, regulators, and society.

Not only environmental resources, but also financial resources for environmental protection are scarce. Firms and governments should therefore spend their budgets efficiently to obtain the most benefit for the environment (Schaltegger, 1997, p.1).

This comment raises the question of how to determine optimal efficiency in the use of societal financial resources, in order to gain the most benefit for the environment.

Benefits to the environment are described by Steger (1990, p.72) as a ‘collective good’ - the benefits exclude no one and so business has historically been unwilling to pay. He asks “...how can corporations go beyond mere compliance with law and instead exhaust market and innovation opportunities with an environmentally oriented strategy?”
Steger suggests that this requires the integration of environmental protection with the goal system of the corporation. This study examines the role of the selected social controls in aligning the goals of the firm with environmental social objectives, by examining the influence of these measures on capital investment decision-making of the firm.

The importance of finance has been stressed in this section. Although such factors as disclosure requirements and stakeholder opinion may arguably be viewed as non-financial, there is a wealth of research evidence which suggests that they have a direct and significant influence on the financial decisions of the firm (Schaltegger, 1997; Bennett & James, 1998; Schmidheiny & Zorraquin, 1998; Graff, Reiskin, White & Bidwell, 1998; Fuchs & Mazmanian, 1998). The financial influence of these selected social controls is discussed in the review of the extant literature in Chapter Two.

1.2.2 Voluntarism and Economic Instruments

Governments around the world are increasingly leaning toward a voluntary approach for achieving environmental improvement. This has been coupled with the use of economic instruments to replace command and control environmental regulation. There has been much debate about the use of the voluntary approach to regulation, to encourage environmental disclosure by companies. On the latter point, Gray, Bebbington and Walters (1993, p.216) comment:

> Whilst there is much to be learnt from voluntary disclosure practices of companies, if one is serious about the need for environmental disclosure, voluntary codes will not achieve it.

The use of voluntarism and of market based measures has lead to the need for more research on their effectiveness:
As policy makers jump on the bandwagon to promote voluntary pollution control efforts through external non-regulatory pressures, there is a growing need for more research on the effect of these programs. Although we know that firms react to these pressures, questions abound: Why do some firms reduce pollution more than others? Which types of regulatory and non-regulatory pressures are most effective and/or more intrusive? Are the non-regulatory programs being used to supplement regulations or are they taking the place of more stringent regulations? Do firms that reduce emissions beyond the required level profit from that behavior? Cohen (1997, p.418).

There is increasing support for encouragement of a strategic approach to environmental regulation by companies (Porter and van der Linde, 1995; Epstein, 1996). Post and Altman (1992, p.4) comment:

So significant have environmental factors become in some industries that the manner in which a company responds to environmental requirements may determine the success or failure of its products, the scope and size of its legal liabilities, and ultimately its profitability.

They add that the USA and some European nations now spend in excess of two percent of their annual gross national product on environmental and natural resource protection. However, the effectiveness of this spending depends upon the relative proportions of spending on environmental improvement and on enforcement of regulations. Skidmore (1997, p.163) notes:

The traditional aims of industry are largely to achieve competitive advantage through products, efficient management practices and consumer recognition of the corporate image. However, by the prudent use of policy it should be possible to harmonise these objectives with sustainable business practice.

Understanding the influence of the environmental social controls will aid in harmonising the objectives of regulators and firms to move towards sustainability.
1.2.3 The Australian Situation

Australia has lagged behind many other developed nations in introducing economic instruments. Requirements for mandatory environmental disclosure are as yet only in the introductory stage and have many inconsistencies. For example, environmental disclosures are required by the extractive industry accounting standard, AASB 1022, particularly in regard to provision for site restoration. Other industries also have significant need to consider site restoration, but there are no standards or regulations which require firms in other industries to make such disclosures. Also, whilst Auditing Guidance Statement AGS 1036 requires auditors to consider environmental matters in the financial statement audit, "there is no governing accounting standard by which to audit" (Institute of Chartered Accountants in Australia (ICAA), 1998).

Economic instruments\(^2\) are frequently specific to a particular geographic area or industry and many apply only to government-controlled entities. Economic instruments which apply to a broad range of privately owned firms are limited mainly to:

- various regulatory costs such as pollution charges (for example, load-based licensing) and cost of compliance with clean-up regulations; and
- subsidisation mainly through the tax system as depreciation allowances for pollution prevention investments.

EPA (NSW) (1998, p.4) compares its fees for sulfur dioxide and nitrogen dioxide emissions\(^3\) with those of other developed nations and comments that:

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\(^2\) A table of the main Australian economic instruments is set out in Appendix 3.

\(^3\) These fees are discussed in more detail in Section 2.2.2.3.
The proposed fee levels are low compared with rates payable under similar schemes in other jurisdictions. They are also significantly less than would be payable if the polluter-pays principle were fully implemented, having regard to the likely costs of pollution impacts on human health and the environment. Instead of immediate implementation of full polluter-pays rates already applicable elsewhere, however, a conservative approach of incremental increases over three years has been adopted.

A review of these fee levels was planned for the third year of the scheme. However, even if NSW fees were doubled, they would be still be relatively low by international standards. Whether this low level of fees is sufficient to significantly influence more pro-environmental capital investment decision-making has not been examined in the literature.

1.3 Limitations in the Referent Literature

The following quote illustrates the importance of the right regulatory mix in achieving optimal environmental performance:

As pressure mounts for companies to develop sustainable business practices, governments need to develop frameworks of policy instruments which encourage a variety of innovations. Appropriate practices will then be available for a variety of problems and locations. Companies must then recognise how to use these instruments so that they retain competitiveness within a sustainable environment. The precise mechanics of appropriate levels of incentives and methods which will encourage innovative cultures in a range of companies with various sizes of installed bases will require research (Skidmore, 1997, p.166).

Finance is particularly appropriate as a means of communication with business. Recall the comments of Epstein mentioned earlier: finance uses the language which business leaders understand - the language of dollars. As such it can be readily incorporated into policy instruments to provide a strong incentive for improved environmental performance.

The comments of these authors underline the importance of finance and social controls which rely on finance to drive firms towards improved environmental performance. However, no study has been found which measures the relative financial influence of
environmental social controls on the capital investment decision-making of the firm.

Schmidheiny and Zorraquin (1998) examine the relationship between financial markets, eco-efficiency and sustainable development. They consider the role of managers, investors, financial analysts, bankers, insurers, accountants and rating agencies and examine their roles and concerns. However, their study stops short of analysing the relative influences (or possible influences) of these players on any aspect of the firm's environmental performance. The utilisation of these players as an adjunct to regulatory forces is examined by Gunningham, Phillipson and Grabovsky (1999, p.211) who argue that government might support traditional regulatory approaches with the use of "regulatory surrogates". They suggest that:

There is, in particular, a range of both commercial and non-commercial third parties that can provide considerable opportunities to extend the means of social control. To date such regulatory substitutes have just begun to be exploited, certainly in the absence of any guiding strategy or principles.

Other literature relevant to this thesis is drawn from various areas of academic and professional environmental business literature. These include the study of capital investment decision-making and environmental costing; economic instruments, and environmental accounting. The following overview of the literature first briefly reviews each of these areas to highlight the lack of research on the relationship between environmental social controls and capital investment decision-making.
1.3.1 Attributes of the Capital Investment Decision

The most direct evidence of the importance of capital investment to the development of environmentally sustainable business practices comes from the substantial investment of the EPA (USA) in research in this area. Most of this research is on environmental costing and its relationship to pro-environmental capital investment. Key reports derived from this research are discussed below.

A report by White (1996, p.198), outlines ways in which environmental costs impact on financial decision-making by corporations. White comments (p.199) that:

New accounting techniques are expanding the measurement of environmental costs and benefits to include regulatory costs, auditing costs, voluntary costs, contingent costs and image/relationship costs. Recognition of the myriad of subtle ways environmental issues impact companies cost and revenue streams is often a first step in developing a proactive environmental management program.

White, Savage, Brody, Cavender and Lach (1995) examine capital investment practices of USA manufacturing firms. They raise questions about changes which are occurring because of the rapid pace of change in business organisations and forces such as merger and acquisition activity, new product development, and changing environmental regulations. They conclude that “capital budgeting practices, at least for environmental projects, have remained relatively constant amidst downsizing, re-engineering, and other trends and styles that are reshaping American manufacturing industry.”

Many firms prioritise ‘end-of-pipe’ projects\(^4\) which are required for compliance, according to Shields, Beloff and Heller (1997). They found many deficiencies in the tracking of

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\(^4\) Examples of typical end-of-pipe projects are site remediation, site closure and decommissioning, pollution rectification (such as the installation of a scrubber on a smokestack) typically to reduce emissions to the level required to comply with EPA requirements (Parker, 1998, p. 68).
environmental costs and a general failure to identify the relationship between managerial decisions and the cost of those decisions. However, Boyd (1998, p.54) considers that firms are "uniquely capable of evaluating" the profitability of environmental investments. He suggests that environmental enforcement is rigid and provides barriers to profitability for pollution prevention projects. Although Boyd's study provides a rich description of environmental capital investment practices of USA firms, it pays little attention to the use of social controls or the introduction of economic instruments, which are an attempt to overcome this rigidity in regulation.

Graff, Reiskin, White and Bidwell's (1998) case studies provide a series of 'snapshots' or applications of environmental accounting applications. These include a number of capital investment examples. They describe the total cost analysis of these investments, but do not examine social influences on the decision. Similarly, the studies by White et al (1995) and Shields et al (1997) pay only limited attention to the influence of regulatory changes or other social influences on capital investment decision-making. A study by the American Institute of Chemical Engineers (1999) provides a detailed analysis of environmental costs but pays little attention to the significance of capital investment.

1.3.2 Literature on Economic Instruments

Lober and Bailey's (1997) study investigates the attitudes and perceptions of managers, and the influence of the US sulfur dioxide trading scheme on their behaviour. This work provides valuable insights into the factors which influence managers' decisions regarding purchase of emission permits or expenditure on various pollution prevention or abatement alternatives. They concluded (p.15) that:
The basic arguments for the allowance trading program’s use and success – (a) that it is a more efficient solution and (b) that industry participants will embrace it as it is more consistent with their norms and goals than are traditional command and control regulations – do not appear to be sufficient by themselves to achieve the program’s cost savings goals...barriers to implementation need to be carefully identified and solutions to overcome these, developed in order to help this market based instrument achieve its significant potential.

Lober and Bailey’s comment about the need for more careful investigation could apply equally to other economic instruments, both prior to and after their implementation.

There is a deficiency in the literature on economic instruments in that little evidence is available on the degree of effectiveness of these new measures as a means of influencing capital investment decision-making.

EPA (NSW) (1994, p.19), in their discussion of the Hunter Valley Salinity Trading Scheme, note their interest in the significance of economic instruments as a means of influencing capital investment decision-making:

There must be incentives for the coal mines to make decisions that minimise overall production costs, including water management and other pollution abatement costs. In designing tradeable permits, the expected influence on decision-making must be paramount. The impact on decisions relating to capital spending is particularly important, since by their very nature capital works ‘lock’ the coalmines into certain strategies that are relatively expensive and difficult to change. Costs associated with capital works constitute a relatively high proportion of the costs of excess water management (Watt 1992) but more importantly capital works’ costs are likely to be an area of major opportunities for improvement.

Little work has been carried out on subsidisation as a means of improving environmental performance. Since subsidies have been used in the past as an incentive for environmentally harmful activities, such as land clearing, they are often viewed in a negative light. The OECD (Potier, 1998) takes this view and has a policy of opposition to environmental subsidisation. However, Lockhart (1997) reports that environmental subsidisation in the USA has been effective in some situations where charges would be difficult to apply. Despite this, little consideration has been given to the use of subsidies
and no research has been found on the relationship between subsidisation and more pro-environmental capital investment decision-making. However, the EPA (South Australia) (2001) discusses a subsidisation scheme for small business which has been in place since 1994. This scheme has produced significant pollution reductions through grants for environmental consultancy and interest-free loans for the purchase of cleaner (less polluting) plant.\(^5\)

### 1.3.3 Environmental Accounting Literature

Environmental accounting literature is a major source of work on stakeholder opinion as well as mandatory environmental reporting. Research from Australia and other countries suggests that firms avoid making negative environmental disclosures (see Deegan and Rankin, 1996). Arlow and Ganon (1982) suggest “economic and financial goals dominate goals related to social responsibility.” Concerns about economic and financial goals are a probable reason for the lack of correspondence between actual performance and pollution disclosures.

Growing costs of environmental remediation can only serve to assure an increasing awareness of environmental risk by creditors. Banking literature indicates that in both Australia and the UK, banks (which are key stakeholders) are becoming increasingly aware of environmental risks (Wright, 1998; Thompson, 1998b). These studies suggest that good environmental performers benefit by lower cost of capital and easier access to funds – factors which are central to the firm’s capital investment decision-making. Mandatory environmental disclosure requirements could be expected to work in conjunction with

\(^5\) This scheme is discussed further in section 2.3.1.2
stakeholder pressure to influence pro-environmental capital investment decision-making. However, no empirical evidence has been found to support this expectation.

Literature on environmental disclosure and its cost to the firm is extensive, yet there is little evidence of its influence on capital investment decision-making, and no attention has been paid to the effect of the introduction of economic instruments on environmental disclosure.

1.3.4 Literature on Firm Size and Industry Type

There is a scarcity of literature which specifically considers the relationship between either firm size or industry type and environmental capital investment decisions of the firm. However, industry type and firm size are often included as variables in studies of the environmental performance or environmental disclosures of the firm. The evidence from these more general studies of environmental performance overwhelmingly indicates the existence of size effects. Large firms have been found to be more environmentally conscious and better environmental performers than small or medium size firms (Ahmed, Montagno and Firenze, 1998; Hossain, Tan and Adams, 1994; Zhuang and Synodinos, 1997; Trotman and Bradley, 1981, Freedman and Jaggi, 1988; Patten, 1992).

Baylis, Connell and Flynn (1998, a & b) and Parker (1998) found evidence of industry effects. Understanding of the needs of particular sectors of industry and studying the link between attitudes and behaviour in different industries is important according to Hutchinson and Chaston (1994). Reichert, Webb and Thomas (2000, p.35) found that “industries that utilise natural resources are more likely than other industries to have formal written environmental policies and practices.”
1.4 Theoretical Approach

Suzuki (1989, p.229) discusses "the need for a profound shift in attitude towards the natural world." He adds "many of us sense in our guts that something is drastically wrong with our obsession with consumption and profit. But is there an alternative?" The urgency of the need for change is stressed in the following view:

The next 40 years thus present an unprecedented challenge: either alter the nature of economic activity or risk irreversible damage to the planet’s basic ecological systems. This portends nothing less than a ‘paradigm shift’ for the field of strategic management because it appears that few, if any, of our past economic and organizational practices can be continued long into the future; they are simply not environmentally sustainable (Hart, 1993, p.988).

These comments strongly suggest the importance of consequences in our environmental research which influenced the selection of a pragmatic (consequentialist) approach to theory in this thesis.

A further concern stems from criticisms of environmental business research. Management accounting literature has been criticised because it borrows heavily from neo-classical economics (Neimark and Tinker, 1986, p.369). Gladwin (1993, p.43) is critical of environmental business research, as "too little of it is driven by theory and rigorous methodology".7

He comments (p. 43) that:

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6 Two philosophies which may underlie normative/interpretive theories such as stakeholder theory are explained by Freeman (1999, p.234):
  1) **Deontological (Kantian)**: belief that the morality of an action is not solely a function of the consequences generated by that action. The rightness of an action may depend on the intent of the actor or the generalisability of the rule, principle or maxim that lead to the action. Philosophers who see a separate normative realm, unrelated logically to the actual world we live in, believe that some actions may be wrong or right regardless of the resulting consequences.
  2) **Consequentialist**: belief that what makes an action right or wrong depends on the consequences generated by that action. A well-known branch of this philosophy is utilitarianism, based on the belief that an action is right if it generates on balance the best consequences for all.

7 Gladwin's criticisms are set out more fully in Appendix 2.
If research on industrial greening is to be broadly utilizable, then three core criteria of the scientific method must be satisfied: (1) adequate description and classification; (2) generalizability of findings; and (3) predictability of conclusions. The review of existing work on industrial greening indicates that most of it is merely descriptive, boiling down to journalistic story telling and case studies. Too little of it is driven by theory and rigorous methodology. As a consequence, greening is probably in an age of superstition...

Arrington and Schwieker (1992, p.527) are critical of accounting research because “there is no consensual ‘philosophy’ of science.” Environmental management research has been criticised by social theorists for its positive stance, whilst social and environmental accounting is criticised by positive theorists for lack of rigour.

1.4.1 Positive and Normative – Competing Theories?

In this thesis it is held that, as suggested by Hart (1995), there is an urgent need for change in business approaches to the environment. This protracted debate between theorists, which stems from the treatment of positive and normative as conflicting theories, distracts researchers from the urgency of the need for research to aid in bringing about change. The overlap between positive (descriptive) and normative approaches is noted in Freeman’s (1999, p.235) discussion of instrumental stakeholder theory:

Instrumental stakeholder theory is not value free precisely because it claims that consequences count. Because consequences count, statements of the form “if A then B” tell us how to produce certain kinds of consequences. By framing the discussion in terms of these consequences, one explicitly is making both a descriptive and normative statement at the same time.

In view of the similarities, it may be beneficial to view the relationship between the normative and positive theories from another perspective. There is much to be gained from focusing on the similarities rather than on the differences and treating them as complementary to each other rather than as competing theories.
The theories discussed above may be used as the basis for a variety of explanations of the findings of this study. Capital investment decisions may be influenced by the firm’s need to account for its actions or by stakeholder requirements. It is equally plausible that a key variable is profit maximisation (or at least satisficing). Society is placing an increasingly high cost on socially irresponsible actions of firms.

Environmental crises such as Bhopal and Exxon Valdez have increased public awareness of environmental and other social costs which may be externalised by business. The costs to the firm include not just clean up costs, fines and penalties but also loss of business and higher costs of capital and insurance. Socially responsible behaviour is self-interested behaviour, necessary for the long term survival of the firm. In this case both normative theories and positive theory enrich our understanding of corporate social reporting without being in conflict.

Viewed from this perspective, there seems room for an eclectic use of theories with the common goal of making progress towards resolving (or at least reducing the extent of) the environmental crisis. The use of eclectic approach to theory is supported by Sayer (1994), who suggests the use of the practical adequacy criterion as a filter.

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8 In accordance with the polluter pays principle this is financial cost.

9 Sayer’s view stems from pragmatist philosophy and has striking similarities with contingency theory. The view of one of the early proponents of the American school of pragmatist philosophy, William James, is described in the following passage by Roth (1993, p.46):

"...pragmatism opens the way for concreteness and adequate explanations, facts and actions. He claims that as a method it is at home with all varieties of philosophy – nominalism, utilitarianism, and positivism."

According to James (1910) “beliefs are true to the extent that they breed true in their consequences”.
The concept of practical adequacy is explained by Sayer (1994, p.69):

To be practically adequate, knowledge must generate expectations about the world and about the results of our actions which are actually realised...

In the context of environmental business research, if stakeholder theory (for example) is found to be reliable in describing and interpreting the environmental behaviour of the firm, it may be said to have practical adequacy. Sayer believes that context is an important consideration in determining practical adequacy. He goes on to say (p.70):

The practical adequacy of different parts of our knowledge will vary according to context. The differences in success of different sets of beliefs in the same practical context and the same beliefs in different contexts suggests that the world is structured and differentiated.

Thus, whatever works in practice may be accepted as ‘true,’ but only within a particular context or set of circumstances. Sayer (p.69) concludes that “(t)he error of conventionalism is to ignore practice and the structure of the world”. This thesis concurs with the views of Freeman and Sayer and relying on these views, positive theory and instrumental stakeholder theory are seen as non-competing theories. They are held to have sufficient common ground to be suitable for use in the eclectic approach to theory adopted for this thesis. An overview of the two theories follows.

1.4.2 Positive Theory

Positive accounting theory stems from realism and positivism. Keynes (1891, p.34-35) described positive science as "a body of systematised knowledge concerning what is" and normative science as "a body of systematised knowledge discussing criteria of what ought to be". This idea was later developed by Friedman (1953) regarding economic theory when he stated that "in principle, there are no value judgments in economics".
The theory of corporate social responsibility was viewed by Friedman (1962, p.133) as a "fundamentally subversive doctrine". He asserted that:

The social responsibility of business is to increase profits. Few trends would so thoroughly undermine the very foundations of our free society as the acceptance by corporate officials of a social responsibility other than to make as much money for their stockholders as they possibly can.

Jensen (1976) observed that the focus of research in accounting had been overwhelmingly normative and unscientific and called for the development of a positive theory of accounting, to explain what accounting is, what accountants do and the effects of accounting on people and resource utilisation. Thus, from its inception, positive theory has been associated with the concept of self-interest which later evolved into the assumption of profit maximisation.

There have been many criticisms of the positive approach to research. Chua (1986, p.610) feels that positive theory takes a supposedly 'value-free' stance and is widely accepted as having neutrality. She comments "that this supposedly value-free stance itself represents the choice of a moral value-laden position is not often recognised."

According to Gray, Khouhy and Lavers (1995, p.51) "positive accounting theory is highly contestable" because of the underlying assumptions of neo-classical economics and has little to offer as a basis for the development of corporate social reporting (CSR). They state (p.51) that:

Apart from the intellectual doubts that one must have concerning the approach, its principle tenets of, first, (allegedly) avoiding any concern with what "should be" and second, deferring all wisdom to (allegedly free) markets runs entirely counter to the principal concerns of CSR which is motivated primarily by the market failures (especially injustices, anti-democratic tendencies, information asymmetrics and 'externalities') and desire to change the current practice.
It may be inferred from this comment that it is less the descriptive methods of positive research and more the presumed underlying assumptions of efficient markets and profit maximisation which many SEA researchers reject. However, positive theory\textsuperscript{10} need not be held to simplistic tenets of market behaviour. Rather it can move us toward a greater understanding of the extant complex decision-making practices of financial managers. The choice of empirical methodologies for this thesis rests on a belief that despite possible limitations regarding the extent to which objectivity can be achieved, positive methods work in practice (that is they have practical adequacy).

1.4.3 Instrumental Stakeholder Theory

Interpretive research, according to Baker and Bettner (1997, p. 293) reflects a methodological perspective and “attempts to describe, understand and interpret the meanings that human actors apply to the symbols and structures of the settings in which they find themselves”. The interpretive paradigm provides instrumental stakeholder theory which is held to have practical adequacy an explanatory tool to aid in understanding the responses of the capital investment managers in the empirical study.

A major difference between normative and instrumental stakeholder theory is that the normative approach prescribes that all shareholders should be considered equally. Fineman and Clarke (1996) take an instrumentalist view and cite Johnson and Scholes’ (1988) argument that it is imperative that in their strategic deliberations, managers understand the expectations and power of different stakeholders. They conclude that

\textsuperscript{10} Some researchers consider the use of the term positive theory is misleading and that it ought to be abandoned (Christensen, 1983, p.7). Christensen asserts that theoretical propositions are “neither positive nor normative in Keynes sense, neither statements of the actual nor of the ideal. Rather, they are statements of the possible.” Christensen suggests that where sciences are concerned with propositions (matters of fact) rather than with proposals (questions of value) the term “empirical” should be used as a substitute for the term “positive.” He also points out that “to the extent that science is theoretical, science is not concerned solely with “what is.”
pro-environmental responses in the four industries they studied, were accounted for mainly by regulators and campaigners. The firm may perceive some stakeholders as a threat if they have the capacity to injure or embarrass as may be the case with green pressure groups or national media, while other stakeholders may be marginalized or rejected.

Freeman (1999, p.235) argues for the practical value in the instrumental approach:

> The normative thesis needs more argument and it is hard to see how such an argument can be connected to real firms and real stakeholders without some kind of instrumental claim. The instrumental thesis needs no more backup if you think consequences count in general and that shareholder value consequences count in particular.

Whilst Donaldson and Preston (1995) and Jones and Wicks (1999) view of instrumental stakeholder theory is that only “fully moral” consequences are acceptable, Freeman (1999, p.235) is critical of this prescriptive approach:

> We need more instrumental theories – that is we need more studies of the kinds of linkages postulated in the instrumental thesis – and fewer of the kind of studies that simply declare “managerial oughts” from general principles. Russell Hardin (1998) has argued persuasively that if we take bounded rationality and a thoroughgoing uncertainty about the world seriously enough, consequences may be all that our moral apparatus can handle.

The following example demonstrates how “the practice and structure of the world” was considered in the selection of theories for the environmental decision-making research in this thesis. Managers may draw on an understanding of what the firm’s stakeholders would want when deciding a course of action over a chemical spill but would be unlikely to consider their role as a capitalist agent in a Marxist (or critical accounting) perspective of the world when making their decision. This attribute of stakeholder theory being applied in practice, is held to make it superior when studying how managers make decisions. Instrumental stakeholder theory is adopted as an explanatory tool to aid in interpreting the responses of capital investment managers in the empirical work of this thesis.
1.5 A Model of the Influence of Environmental Social Controls on the Capital Investment Decision-Making of the Firm

The model sets out the relationships posited to exist between the four environmental social controls, viz., (a) mandatory disclosure, (b) regulation, (c) subsidisation and (d) stakeholder opinion and the capital investment decision-making of the firm. The model also includes the expected influence of three moderating variables, viz., firm size, industry sensitivity, and individual manager disposition towards environment. These moderating variables are expected to affect the way in which the social controls influence capital investment. The relationships posited to exist between the variables are set out in the model in Figure 1.1. The variables set out in the model are described below. More detailed description and discussion of evidence from the literature about each of these variables is set out in the literature review in Chapter 2.

1. **Mandatory Environmental Disclosure**

The main mandatory disclosure requirements in Australia are those of corporations law, accounting standards and the National Pollutant Inventory.

2. **Stakeholder Opinion**

The opinion of various stakeholders is held to pressure firms to improve their environmental performance. Key stakeholders include government agencies, banks, insurance companies, employees, customers and green pressure groups.

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11 Although individual manager disposition has been included for completeness of the model, it is an elusive concept and will not be tested. Further discussion on this point is included in section 1.9.2.2.
3.  **Subsidisation**  
Environmental subsidies are provided in the form of direct payments and tax concessions which have objectives of environmental protection or improvement. Subsidisation in Australia is mainly indirect through taxation depreciation allowances.

4.  **Regulation**  
Regulation of firm environmental performance is carried out mainly by the state environmental protection agencies (EPAs). EPAs can impose various charges for pollution such as licensing costs, emission and disposal charges and fines and penalties.

5.  **Firm Size**  
Firms may be constrained in their response to the social controls by their size, since small and medium sized entities are less regulated and often may not be able to afford the costs of new technology.
6. **Industry Type**

Industries which have significant impacts on the environment are likely to be more responsive to social controls, as more attention is paid to their environmental performance by regulators and other stakeholders.

7. **Management Disposition**

Individual managers are expected to vary in their level of concern about the environment and the pollution produced by the firm's operations. This individual manager disposition towards the environment has been termed 'management disposition' in this thesis. Whilst this is likely to influence the way in which managers feel about pollution issues, it is probable that the managers' capital investment decisions will be mostly subsumed by firm climate and culture (see Ford and Richardson, 1994).

8. **The Decision Maker**

The decision makers investigated in this study are financial managers involved in capital investment decision-making. They are henceforth referred to as capital investment managers.

9. **The Capital Investment Decision**

Australian capital budgeting evaluation practices are consistent with those of other Western countries and discounted cash flow techniques such as net present value and internal rate of return have been found to be important (Kester, Chang, Echanis et al, 1999). Studies of capital investment decision-making (such as that of Butler et al, 1993) and of environmental capital investment decision-making (such as White et al, 1995) have found that a tiered structure for capital investment decision-making is common. The final decision for large projects is generally taken at the senior management level.

Firms are now being made more aware of the importance of environmental issues in risk evaluation, because of the increased interest of banks and insurers. Poor environmental performance may affect availability and cost of both borrowing and insurance. Managers
have been found to consider strategic factors more important than financial factors in their capital investment decisions (Butler et al, 1993). This raises many questions about the influence of these factors on capital investment decision-making. It posited that environmental social controls may influence firms to consider environmental risks (such as risk of fines and damage to reputation which may arise from pollution or chemical spillages) in their capital investment decision-making. The capital investment decisions investigated in this study are production-related decisions. Managers were informed that suitable decisions could include but were not limited to investments which might be considered specifically environmental.

**Relationships Set Out in the Model**

A firm which is concerned about the cost of damage to its reputation which arises from poor environmental performance could be expected to increase its capital expenditure on pollution prevention or abatement equipment or on cleaner production processes. A nexus established between the use of a social control measure and a pro-environmental influence on capital investment decision-making is an indication of a measurable degree of effectiveness in the use of that measure. The existence of this nexus will be examined in a decision-making experiment, which tests for main effects and interactions of the social controls on the capital investment decision.

The importance of interactions stems from the possibility that managers may not consider the social controls individually but may form composite cues. As an example they may evaluate the impact of pollution charges by offsetting a depreciation allowance against them, thus forming a combined cue ‘net pollution charges’ (this is termed ‘configural cue processing’).
1.5.1 Significance and Purpose of the Study

The harmonisation of business objectives with sustainable business practice is central to this thesis. What types of regulation are successful and to what degree? Is it better to offer more ‘carrots’ (incentives) to firms and to what degree will this render ‘sticks’ (in the form of ‘command and control’ regulation and liability law) unnecessary? These questions of social significance remain largely unanswered. Section 1.5.1 explains the significance of this study in furthering knowledge of these issues. The statement of purpose is set out in section 1.5.2.

1.5.1 Significance

The development of the mix of regulation and incentives that most effectively promote cleaner production should be an aim of both governments and companies (Skidmore, 1997, p.163). This thesis will add to knowledge about the manner in which capital investment decision-making of Australian firms is influenced by mandatory environmental disclosure, regulatory controls, environmental subsidies and stakeholder opinion. It will add to knowledge of the effect on capital investment decision-making of the firm’s attitude of various stakeholder groups.

Environmental social controls are costly to the community in terms of: (i) direct costs of implementation and compliance with regulatory measures, laws and standards and (ii) indirect costs which arise through poor environmental performance, if the effectiveness of social controls is low. These costs may include damage and injury from catastrophic
accidents and higher but less noticed costs such as medical treatment for pollution related illness and clean-up of pollution which cannot be attributed to any one polluter.

Gunningham, Phillipson & Grabosky (1999, p.211) note that:

...the strategy of using regulatory agencies to curb environmental degradation caused by the behaviour of corporations and others is fraught with difficulty. Environmental regulation...is sometimes inflexible and excessively costly for business to comply with...

Gunningham et al (p.211) consider that innovation is needed, and suggest the use of "government intervention, but selectively and in combination with a range of market solutions..." This strategy is already in use and is applied through a range of economic instruments. However, other than the research sponsored by the US EPA (for example: White et al, 1995, Shields, Beloff and Heller, 1997; Boyd, 1998) there has been little research to indicate the effectiveness of measures currently in use as an influence on capital investment decision-making.

1.5.2 Statement of Purpose

The primary purpose of this research is to determine whether significant differences exist in the nature and effect of the four social control measures as incentives for more pro-environmental capital investment. Secondary objectives of the study are to:

(i) Determine whether managers consider these social controls individually or in combination (configurally).

(ii) Gain an indication of the relative influence of a range of environmental and non-environmental factors in capital investment decision-making.

(iv) Examine the influence of the identified moderating variables viz. firm size, industry type, on the capital investment decision-making of the firm.

(v) Describe broadly Australian managers’ perceptions of the environmental issues in capital investment decision-making.
1.7 Research Methodology

A two stage self-administered survey is used to test the model. In Stage 2 of the survey questionnaire the relative influence of the four social controls on the capital investment decision-making of the firm is tested by the use of factorial experimentation. In Stage 1 passive observation is used to gain an indication of:

- The relative influence of the social controls on a range of attributes of the capital investment decision.
- The influence of environmental factors relative to non-environmental (financial and strategic) factors.

1.7.1 Experimentation

Each of the social controls will be manipulated in an experiment to determine its relative influence on the capital investment decision-making of the firm, both independently and in combination with other variables. This will be achieved by testing for main effects and interactions.

Experimentation allows the researcher to intervene and control the situation, thus permitting the evaluation of causal relationships (Zikmund, 1997). A fully crossed $2^4$ (16 cases) experiment is employed to determine the relative influence of the four social controls which are the independent variables of the model. Experimentation is held to be an appropriate method to use for this investigation. Raghbir and Das (1999, p.56) provide support for this view:
We argue that theory-driven experimental inquiry has the potential to provide a unique understanding of how people make financial decisions. Such an understanding should lead to a prediction of microlevel behavior and testable hypotheses, some of which may be aggregated and thus manifested in macrolevel effects. An understanding of the antecedents, or causes, of an effect is crucial to managing that effect—an issue of importance not only to traders and risk managers but also to consumers, public policymakers and regulators. A unique appreciation of the cause of an effect provides a tool to reduce the size of the effect, leverage off it, or rigorously account for it in mathematical modelling to capture descriptive reality rather than normative behavior. Experimental inquiry is the single most appropriate methodological tool for isolating causes of behavior and for complementing existing empirical paradigmatic approaches in behavioral finance.

The possibility of also including mainstream financial and strategic factors (such as discounted cash flow, strategic fit and effect on product quality) in the experiment was examined. However, a balanced experiment in which the influence of both environmental and mainstream factors were tested would require the inclusion of an additional four mainstream factors. An eight-factor experiment would require unacceptable additional cost of both resources and the demands placed on subjects in terms of time and task complexity.

As noted by Schulz (1999, p.33) “researchers are constrained to some extent by the number of manipulations possible given the number and amount of subjects available”. Although a larger number of factors could have been accommodated in the experiment by the use of a fractional factorial design, an important aspect of the experiment concerns the interactions between variables. Since a use of a fractional factorial design for eight variables would result in the loss of data on many of these interactions, it was deemed to be unsuitable.
1.7.2 Passive Observation

The experimental findings will be supported by additional study of the relationship between the social controls and the capital investment decision through passive observation. Passive observation contrasts with experimentation because the researcher merely observes events rather than directly intervening. Although passive observation has less strength in determining causal relationships, the investigation of a range of attributes of each social control and the larger sample sizes, make the results more generalisable.

The purpose of the passive observational survey is to test a range of indicators of each social control. It also measures a range of attributes of mainstream financial and strategic factors in the capital investment decision and a range of environmental costs. The multiple purposes of the passive observation study are:

(i) To provide additional evidence regarding the influence of the social controls.

Whereas the experiment tests capital investment manager responsiveness to various hypothetical combinations of these measures, passive observation is used to gauge the managers' response to the current combination of social controls.

(ii) The passive observation section of the study gives an indication of the proportion of the capital investment decision which is attributable to environmental factors (as opposed to mainstream financial and strategic factors). Although stronger evidence of a cause-and-effect relationship is gained from experimentation, passive observation was chosen for this aspect of the study because it allows the examination of a larger number of variables than experimentation. The difficulties of using experimentation to investigate this problem are noted in section 1.7.1.
(iii) Data from the passive observation study will be grouped to test for firm size and industry effects.

(i) The examination of a range of attributes of each social control provides a broader description of Australian managers' perceptions of their capital investment decision-making.

(ii) Although environmental attributes of the capital investment decision are discussed in the environmental costing literature, there is little to indicate which environmental factors are costed by Australian capital investment decision-makers. Thus, to add to the description of capital investment decision-making in Australian firms, data will be collected in the passive observation study on environmental costs.

1.7.3 Implementation of the Study

A two-stage postal survey instrument was used to collect the data for this study. A sample of Australian firms from manufacturing and extractive industries was surveyed to examine capital investment manager perceptions of environmental factors relevant to capital investment decision-making and the extent of their influence on the decision.

1.8 Definitions

The definitions provided in this section indicate the meanings of the terms as used in this thesis.

Social Controls: In this study refers to measures employed by society to encourage or compel the use of cleaner production processes and conservation of natural resources by firms.
(a) **Capital Investment Decisions**

Decisions pertaining to acquisition of long-term assets (such as property and plant) for the purposes of production or associated pollution reduction or avoidance.

(b) **Economic Instruments**

Economic instruments aim to influence decision-making and behaviour in such a way that alternatives are chosen that lead to an environmentally more desirable situation than in the absence of the instrument. Such instruments are often referred to as market-based instruments, as they work by using market signals, such as prices, to encourage better decisions.

Economic instruments may be classified as: (i) taxes and charges; (ii) subsidies and tax concessions; (iii) property rights and market creation; (iv) financial enforcement incentives; and (v) deposit refund systems (Rae, 1997, pp.161-2).

Compared to regulation, market-based instruments allow greater flexibility in the choice of the means to reduce environmental damage. By doing so, they can be more cost-effective. Economic instruments can also make the costs of environmental protection transparent and encourage greater innovation in cleaner (less polluting) technologies.

(c) **Environment**

The physical environment. The *Protection of the Environment Administration Act* 1991 (NSW), defines the physical environment as:

Components of the earth, including a) land, air and water; b) any layer of the atmosphere; c) any organic or inorganic matter and living organism; and d) human-made or modified structures and areas, and includes interacting natural ecosystems ....
(d) 'Environmental' Capital Investment

In this thesis 'environmental' capital investment refers to capital projects for environmental improvement, such as pollution prevention or abatement, or projects in which pollution prevention or abatement or clean-up is a significant cost component.

(e) Environmental Costs

Environmental costs include the costs of steps taken by a firm, or on its behalf by others, to prevent, reduce or repair damage to the environment which results from its operating activities, or to deal with the conservation of renewable and non-renewable resources. These include (inter-alia): environmental research and design costs; cost of environmental training of employees; air/waste water/hazardous waste monitoring; air/waste water/hazardous waste disposal; waste reuse and recycling; off-site hazardous waste storage, treatment and disposal; on-site hazardous waste storage and handling; on-site air emission controls; water costs and reporting to government agencies.12

(f) Environmental Performance of the Firm

The extent to which the firm achieves cleaner (less polluting) production and environmental conservation.

(g) Environmental Regulation/Regulatory Costs

Costs incurred for pollution including:

i) Pollution Charges

Direct payments on the quality or quantity of pollutant emissions discharged

(Barde and Smith, 1997). They may be applied to products either at the time of

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12 (This definition was based upon that of the Accounting Advisory Forum, (1996, p.11). However the AAF definition excludes costs of fines, prosecutions and losses attributable to poor environmental performance - for the purposes of this study, these have been included in the definition).
manufacture, consumption or disposal. Examples are air pollution charges and taxes (such as carbon taxes), user charges for the cost of collection and treatment of solid waste and product charges such as taxes on fertilisers and pesticides. The purpose of these charges may be to rectify environmental damage or to change the consumption pattern of users towards less polluting products. Funds raised by the charges are used for various environmental protection measures or general revenue.

ii) Site Remediation Costs

Costs incurred for the clean-up of contaminated sites, or restoration of excavated sites, to a standard directed by the EPA.

(h) Mandatory Disclosure

Environmental disclosure required under Australian accounting standards, government regulations and law.

(i) Subsidies

Direct payments and tax concessions which have objectives of environmental protection or improvement. The main environmental subsidy employed in Australia is depreciation allowances through the tax system.

(j) Stakeholder Opinion

Stakeholder opinion in this thesis refers to non-government stakeholders (government stakeholders are investigated through the other independent variables viz., regulation,
subsidisation and mandatory disclosure). Examples of non-government stakeholders include banks, insurance companies, employees, customers and green pressure groups.

(k) Management Disposition

In this thesis the term ‘management disposition’ refers to individual manager’s disposition towards the physical environment (this refers to the extent to which the manager is concerned about or has the will to promote cleaner production and/or conservation of natural resources).

1.9 Assumptions and Limitations of the Study

The following assumptions and limitations apply to this study.

1.9.1 Assumptions of the Study

In the experimental study, the investment managers surveyed are assumed to be able to use the hypothetical data to make valid and reliable capital investment decisions. An indication of the reasonableness of this assumption is gained from the capital investment manager assessment as to whether the investment proposals capture the essential environmental aspects of the capital investment decision (see section 4.2.1).

1.9.2 Limitations

Three types of limitations apply to this study. These are limitations of scope, design and application. The principal limitations of the study are set out in the following sections.
1.9.2.1 Limitations in Scope

The responses of the firm to incentives provided by environmental social controls are extensive and varied. This study is limited to considering how these measures affect environmental financial decision-making of the firm only in relation to its capital investment decisions.

The experiment is limited to considering the influence of mandatory environmental disclosure requirements of law and accounting standards, regulatory costs, subsidies and stakeholder opinion. As noted in section 1.7, many other variables influence capital investment decision-making. These include inter-alia a range of non-environmental (financial and strategic) factors. Although these factors could not be included in the experiment, the influence of a range of environmental and non-environmental attributes of the capital investment decision is measured in the passive observation study.

The study examines only major areas of environmental social control. Many economic instruments have been implemented which could not be included in this study, notably tradeable emissions permits. A more detailed examination of the effectiveness of various economic instruments would contribute much more detailed information than this current study can provide. The description of the costs considered in capital investment decision-making is limited to the investigation of the influence of a range of costs suggested by the literature as relevant (see White et al, 1995). It does not extend to the examination of the nature of cost assessment ie. qualitative, technical/numerical, or financial assessment.

The decision unit in the study is the capital investment manager. A description of the manager as a decision-maker is presented in Chapter Two. Additionally, the use of configural cue processing by the capital investment manager is measured in the
experiment. However, a more detailed study of the decision-maker would require extensive resources and was held to be beyond the scope of this study. The study is limited to firms in manufacturing and extractive industries. Investigation of a wider range of industries such as power producers and other government authorities would require a much larger commitment in terms of time and would make the discussion excessively complex.

1.9.2.2 Limitations in Design

Management disposition is not included in the empirical work of this thesis. It is an elusive concept, requiring extensive testing using methods which are not cost/benefit efficient when viewed in light of the thesis’s research objectives. To add to the reader’s understanding of the decision-maker a discussion of individual manager disposition has been included in the literature review. However, managers are in the main required to make their decisions according to the policies of the firm (Butler et al, 1993) rather than personal disposition. Therefore, it is posited that its effects relative to the other variables would account for only a small amount of variance.

1.9.2.3 Limitations in Application

Caution must be exercised in applying this study’s findings to other than Australian firms given the use of an Australian sample. Australian environmental and corporate law and accounting standards and instruments used for environmental regulation differ from those used in other developed countries. However, as Australia is involved in standardisation measures such as the International Harmonisation Agreement (for accounting standards) the degree to which discrepancies arise is expected to be limited.
1.10 Overview of the Remainder of the Thesis

A discussion of the extant literature relevant to various aspects of the environmental decision making process is set out in Chapter Two. Chapter Three sets out the detailed research questions and research methodology. The results of the study in Chapter Four include the degree of importance to management of each of the factors relevant to capital investment decision-making, the effectiveness of each the instruments studied, the influence of moderating factors such as firm size, management disposition and industry sensitivity, and the nature of their impact on the dependent variable - capital investment decision-making. Chapter Five reviews the results in the light of the extant literature and presents conclusions made. The chapter also sets out the limitations of the study and suggestions for further research.
Chapter 2

Literature Review

2.1 Introduction and Chapter Overview

Chapter Two reviews the extant literature relevant to the four social controls, the moderating variables and the dependent variable. Few studies have been found which give any indication of the relative influence of the social controls on capital investment. No study has been found which indicates the relative weight of the social controls in the capital investment decision.

Studies of the influence of various aspects of social control generally consider the influence on 'greening' or on the 'environmental performance of the firm' (see, Tilt, 1997). However, 'greening' and 'environmental performance' are vague terms which encompass many dimensions of the firms environmental performance including capital investment. Therefore, in the absence of more specific information, these studies have been used to infer the likely response of the firm to environmental considerations which may influence its capital investment.

The chapter is set out as follows:

Section 2.2 provides an overview of the current use of environmental regulation and the growing use of economic instruments, namely pollution charges such as load based
licensing and user charges for waste management. Subsidies and tax concessions, which provide incentives for improved environmental performance, are discussed in section 2.3. Influence of stakeholder opinion is then considered in section 2.4. Section 2.5 provides an overview of Australian environmental disclosure practices and discusses the evidence on the likely influence of the disclosure requirements.

Literature on the effect of the selected moderating variables on the decision is reviewed next in section 2.6. In Section 2.7 the nature of the decision-maker is examined focussing on who makes the decisions. In section 2.8 the dependent variable, viz., capital investment decision-making is discussed to determine how decisions are made. Section 2.9 examines the aspects of human information processing considered relevant to the thesis. The chapter concludes with a discussion of the relationship of the study to the extant literature in section 2.10.

2.2 Environmental Regulation

Regulation is a major means by which governments can ensure strong environmental performance from industry. It is seen by some as the only ‘fail-safe’ mechanism for environmental protection. Regulation is a powerful industry motivator, and provides legal recourse for government and the community against polluting industries (Australia and New Zealand Environment and Conservation Council (ANZECC), 1998).

Regulation undoubtedly has great power and can be expected to strongly influence capital investment. ‘Policing’ of environmental law is carried out under state law. Australian state EPAs are empowered to issue licences to commercial and industrial premises and to issue notices or prosecute if license conditions are breached. EPAs regulate large industries while small firms are increasingly regulated by local councils (EPA (NSW) Information Sheet 2). It is the responsibility of each individual firm to exercise ‘due diligence’. This means that
managers must be able to demonstrate that all reasonable precautions have been taken to protect the environment and to avoid environmental incidents.

Australian state legislatures and EPAs are involved in making changes to laws and regulations for dealing with pollution emissions and contaminated land. The intention of regulators is to achieve a less litigated approach with economic instruments allowing managers a greater choice of methods to deal with clean-up and pollution reduction. Many economic instruments were introduced during the 1990s to replace command and control (direct) regulation which is steadily being phased out. An important reason for this change is that under direct regulation, fees “are only weakly linked to pollutant loads and do not provide sufficient incentives for pollution reduction” (EPA (NSW), 1998, p.21). James (1997) points out that:

A broad distinction can be drawn between direct regulations (commonly described as command-and-control mechanisms) and economic instruments... In reality, the distinction between direct regulations and economic instruments is often blurred as any system of economic instruments usually requires appropriate legislative or regulatory backing. Wherever economic instruments have been used, in Australia and overseas, supporting regulations have been applied.

However, James also comments that although economic instruments are believed to achieve environmental objectives at least cost to the community, poorly designed economic instruments can cost as much as command-and-control systems. As an example, the introduction of a weight-based garbage disposal fee was found to encourage the burning of waste (Thorgersen, 1994, p.417).

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13 The Contaminated Land Management Act (NSW) 1997 has replaced the Environmentally Hazardous Chemicals Act (NSW) 1985 and provides a single piece of legislation to deal with contaminated land. Victoria and South Australia have similarly introduced changes. The provision of the Protection of the Environment Operations Act (NSW) 1997, will significantly alter the environment protection licensing system in NSW (NSW EPA, 1998, p.8). Amendments were also made to the Pollution Control Act (NSW) 1970, to allow the introduction of economic instruments such as load-based licensing (LBL) and tradeable emission schemes.
The interest of EPA (NSW) (1994:19) in capital investment is apparent in their discussion of the Hunter Valley Salinity Trading Scheme. High capital costs of coal mines include the provision of additional water storage facilities and EPA (NSW) relates this to the aim of introducing the trading scheme.

The impact of economic instruments is uncertain, both here in Australia and worldwide. Barde and Smith (1997, p.23) comment of economic instruments: “The data necessary to perform evaluations of their effectiveness are often lacking, simply because they are often implemented without forethought being given to the collection of such material”.

This thesis does not focus specifically on economic instruments. However, the main economic instruments which affect private industry in Australia are necessarily included in the discussion of regulatory control. In section 2.2.1 contaminated land is first considered, followed by the influence of environmental taxes and charges. In section 2.2.2 emission charges are discussed.

2.2.1 Contaminated Land and Site Clean-up

Public concern about site contamination was heightened with cases such as that of the Love Canal housing estate in New York State (Rubenstein, 1991). As illustrated by the Love Canal case, the problem is that current owners may become liable for pollution caused by previous owners of a site.

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14 There is insufficient use of trading schemes in Australia to include them in the empirical study. The Hunter Valley Salinity Trading Scheme (involving about 15 coal mines and two government operated power stations) is a “test case.” EPA (NSW) (1994) reports that this scheme is, so far a success. However, after an EPA (Victoria) (1993) assessment of trading schemes reported on many potential problems, the EPA (Victoria) seems averse to their introduction.
The USA’s Comprehensive Environmental Response, Compensation and Liability Act 1980 (CERCLA or ‘Superfund’) was introduced to deal with the huge cost of large numbers of contaminated sites. However, in the first ten years of the Superfund program, $10 billion was spent to clean up only 60 hazardous waste sites. Hoffman (1996, p.1) notes that one of the implicit goals of the Superfund program – to drive technology in a socially beneficial direction – is not succeeding:

Built largely in an atmosphere of confrontation, the Superfund program is unique among national efforts to control environmental problems...the program is inherently litigious which tends to stifle technological development.

Even the cost of an assessment of a clean-up for a superfund site can cost millions and take more than two years to complete (Barth and McNichols, 1994). These problems have caused concern in Australia where “...community perception has been fuelled by experiences overseas” (EPA (NSW), April, 1996, p.5).

In dealing with contaminated sites, Australian EPAs currently place much less pressure on firms than in most other developed countries (EPA NSW, 1998, p.4). However, environmental laws have been tightened considerably. Bates (2000, p.419) notes that in Australia current operators and occupiers may become liable for clean-up costs caused by the actions of previous operators or occupiers. In NSW the EPA has discretionary power to prosecute and encourages a cooperation and voluntary disclosure of environmental incidents. However, NSW law allows for maximum penalties of $1 million for corporations and $250,000 and/or seven years imprisonment for individuals, for breaches of environmental law. In addition to these fines, costs of clean-up and remediation and possibility of civil damages where other parties are affected, all add to the uncertainty of assessing the magnitude of a liability.
The discretionary powers of the EPA give rise to many uncertainties for firms because potential damage to the environment is difficult to gauge and benchmarks for environmental values are lacking (Milne, 1996, p.81). A Canadian study provides a comment which is equally relevant to Australia:

Environmental legislation mandates anyone in control of a pollutant to exercise due diligence and to do anything ‘practicable’ in the case of pollution. Nevertheless, the judgmental nature of ‘doing everything practicable’ and exercising due diligence makes proper assessment of liability arising from an environmental incident difficult. In many cases this issue can be resolved only in a judicial process, which introduces the uncertainty of a court hearing (Li, 1995, p.19).

While this judgemental process may aid in taking into account mitigating factors in individual cases, it also adds to the uncertainty in assessing the liability. The Superfund program illustrates the damage which may be caused to society and business when social controls are inefficient.

Environmental costs may arise from impairment of the firm’s assets (such as land degradation); these are costs incurred for environmental reasons when no benefit is expected (such as shut down of facilities due to environmental concerns) (CICA, 1993, p.11). Brennan (1995, p.120) adds other costs: adverse publicity; increase in insurance premiums; disruption of business and loss of morale amongst staff. Capital investment seems likely to be an important aspect of environmental performance from a lender’s perspective, as purchase of polluted land could result in liability for the lender. Also, resale value of mortgaged land may be reduced if it becomes polluted. Australian lenders may incur liability according to Bates (2000, p.420):

It seems clear that where a lender takes possession of property upon mortgagor default, or appoints a receiver and manager to protect its security, it will incur liabilities as occupier or under a duty to indemnify. Equally critical in practice, however, is whether financiers can be liable for offences that took place before default, that is, during the loan period.
Thus although Australian law and regulatory processes may be viewed as less onerous than CERCLA, Bates view suggests strong reasons for lenders to be concerned about a firm’s environmental performance.

Hoffman (1996) suggests that to tap the creative energies of the technological market, policy must create incentives that establish clear rewards for the entrepreneur. He adds (p.2) that market power, firm size, industry structure and the competitive market, all play a critical part in deciding who will innovate and whether they will be successful. He concludes (p.10) that:

> The effects of the Superfund program on the development of new technology is a vivid example of how a regulatory program can alter the basic mechanisms of commercial development. In this instance the result is inefficient allocation of tax resources and the inhibition of research and development output. Understanding the motivation for firms to develop remediation technologies is critical to the assessment of policy options for promoting any kind of environmental improvements... As the debate over environmentalism becomes increasingly hostile and environmental interests collide an opportunity arises for the rational analysis of the relationship between societal demands for, and industrial responses to, environmentalism.

Australia must avoid costly mistakes such as those of Superfund. Increased understanding of environmental social controls provided by this study will aid in their more effective use to achieve this objective.

### 2.2.2 Pollution Charges

Pollution emissions are taxed by EPAs through ‘user-pays’ charge systems, such as load-based licensing. Water authorities also allow disposal of some trade waste through the sewerage system, although the principle of ‘user-pays’ does not seem to be applied to trade waste schemes.
Dodds (1999, p.10) notes that emissions taxes\(^\text{15}\) are among the most efficient means of addressing environmental pollution. The reasons for this are that:

At an individual level, the tax allows least cost abatement measures to be implemented first. At an aggregate level, an emissions tax encourages those polluters who can reduce pollution at least cost to abate a relatively larger proportion of total pollution than those polluters for whom it is more expensive. (In comparison, a standard regulation may only impose stricter environmental standards on new projects or investments, or may require all polluters to reduce emissions by the same proportion, irrespective of the relative costs of doing so.) Emissions taxes thus minimise the cost of achieving a reduction in emissions at both individual and aggregate levels.

In his discussion of emission taxes, Dodds (p.31) identifies the NSW load-based licensing scheme as "having many of the desirable features of a well-defined emissions tax". The desirable features are (i) they are comprehensive (ii) the charge is based on the quantity of measured discharge and (iii) the tax rate depends on the type of pollutant and nature of the environment into which it is discharged. A more detailed discussion of load-based licensing and water authority trade waste schemes follows.

2.2.2.1 Load-Based Licensing

Load-based licensing (LBL) is an emissions charge scheme which shifts the primary focus of the licensing system from controlling concentrations of pollutants in emissions, to controlling the total mass (or load) of pollutants discharged. NSW began phasing in LBL in 1996, while in Victoria a scheme has been in operation since 1991. One of the objectives of LBL is to encourage the adoption of cleaner technologies (EPA (NSW), 1998). This implies the need for capital investment, yet little attention has been given by researchers or regulators to investigation of the influence of emission taxes as motivators for increased investment in cleaner technology.

\(^{15}\) The terms 'pollution charges' and 'emission taxes' (as used in this thesis) are synonymous.
Although the NSW licensing system will charge fees in accordance with the pollutant load, concentration limits will be retained to prevent acute impacts. EPA (NSW) (1998, p.20) notes that:

Within the constraints of the load limits licensees will generally be free to select a discharge management strategy that balances the cost of licence fees with pollution reduction measures. The EPA will retain the discretion to require environmental improvement by licensees at any time, where there is a pressing environmental need to do so.

A 1997 survey (EPA (NSW)) of firms found that 63% of respondents accepted the principle of ‘polluter-pays’ and the use of economic instruments, while only 8% opposed the plan to introduce LBL. However, 23% of respondents suggested the need for a detailed assessment of the economic impact of the scheme. EPA (NSW) (1998, p.53) discusses the cost of LBL to firms:

The impact that the LBL Scheme will have on licensed firms, the industries in which they operate and on the broader economy will depend upon the level at which the incentive charges are set, the amount of abatement that is induced and the net cost of undertaking that abatement. ...the expected level of abatement (and therefore the associated costs) are key unknowns and are difficult to predict with any degree of confidence.

Hamilton, Hundloe and Quiggin (1997, Section 6.3) comment that “the impact of existing systems of load-based licensing is difficult to assess at this stage, but they appear to be significant motivating factors in reducing pollution”. However, the low level of emission charges, relative to international charges must be kept in mind. The empirical work of this study includes measurement of the influence of these charges. Although it may be expected that the charges will have a generally pro-environmental effect, it is possible that the charges may be insufficient to significantly influence capital investment decisions.
2.2.2.2 *User Charges for Waste Management*

A number of water authorities, including Melbourne Water and Sydney Water have introduced industrial user charges relating to disposal of trade waste through the sewerage system. The intention is to raise the charges in future years to encourage waste minimisation.

The current Sydney Water Trade Waste Policy and Management Plan commenced in 1988 (Sydney Water, 2001). Charges applied depend on the nature and concentration of the waste discharged. Sydney Water (sydneywater.com.au, 29/6/01) reports on trade waste pricing principles: “It is proposed therefore that trade waste charges be set to recover only the annual operating costs associated with administering trade waste policy, and monitoring and treating the trade waste flows.” The report adds that a Trade Waste Charges Working Group in 1997 indicated that the EPA’s LBL scheme is intended to replace both current licence fees and pollution taxes. Further reform is proposed to allow LBL fees to be passed to the customer through trade waste charges, thus avoiding the need for a separate pollution tax.

However, no change is planned to the ‘cost only’ approach to charges. Sydney Water's aim is to avoid creating a disincentive for customers to avoid joining the trade waste system, in order to reduce the incidence of illegal discharges of substances. They note that they “do not consider it appropriate to fully recover these costs from customers by way of agreement or other fixed charges”. The levels of customer agreement fees have therefore been held at rates “largely in line with previous years”. However, for smaller customers the report notes that “it is neither practical nor affordable for customers’ discharge rates to be flow-measured.
and sampled”. An assessed charge is therefore determined from a sample of customers using particular processes.

Whilst the cost of monitoring customers and preventing illegal use may be considerable, this lack of monitoring suggests that small customers may be able to over use the system with little risk of detection, whilst the policy of minimal charges throws the cost of pollution onto society. Although LBL is meant to be a “user-pays” system, this suggests that the “user-pays” approach is not being supported by Sydney Water.

The policy of charging at ‘cost only’ suggests that these charges may be too low to provide an incentive to firms to invest in cleaner production. However, no investigation of the impact of these charges on capital investment has yet been made. The impact of these charges on capital investment will be investigated in the empirical work of this study.

2.2.2.3 Financial Effects of Emission Taxes and Charges

Emission taxes and charges in Australia are generally quite low by comparison with those of other developed nations. As an example the proposed average maximum NSW fees charged for sulfur dioxide and nitrogen oxide emissions are compared with those under comparable international schemes in Table 2.1.
Table 2.1  
International Fee Comparisons

<table>
<thead>
<tr>
<th>Fees For Nitrogen Oxides</th>
<th>$A/tonne</th>
<th>Fees for Sulfur Dioxide</th>
<th>$A/tonne</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW EPA (av.)</td>
<td>$6</td>
<td>US (Minnesota)</td>
<td>$24</td>
</tr>
<tr>
<td>US (Minnesota)</td>
<td>$23</td>
<td>France</td>
<td>$33</td>
</tr>
<tr>
<td>France</td>
<td>$33</td>
<td>Czech Republic</td>
<td>$33</td>
</tr>
<tr>
<td>US (California)</td>
<td>$238-$576</td>
<td>NSW EPA (av.)</td>
<td>$68</td>
</tr>
<tr>
<td>Japan</td>
<td>$258-$2322</td>
<td>Poland</td>
<td>$76</td>
</tr>
<tr>
<td>Norway</td>
<td>$3,148</td>
<td>US (California)</td>
<td>$195-$479</td>
</tr>
<tr>
<td>Sweden</td>
<td>$5778</td>
<td>China (proposed)</td>
<td>$350</td>
</tr>
</tbody>
</table>

Source: NSW EPA (1998)

It is acknowledged by the EPA (NSW) (1998, p.4) that the level of proposed NSW fees is low compared with similar schemes in other developed nations. They also note that these fees are significantly less than those required to fully implement the polluter-pays principle. Although a review of these fee levels is planned for the third year of the scheme, a huge increase would be needed to make them comparable with international standards. Whether this low level of fees is sufficient to significantly influence more pro-environmental capital investment decision-making has not been examined in the literature.

The literature dealing with these schemes is limited and provides no indication of whether pollution charges are sufficient to drive firms towards increased spending on pollution-reducing capital investment. The impact that these schemes will have on firms depends upon the level of the charges, the amount of abatement required and the net cost of undertaking that abatement (EPA [NSW] 1998, p.53). However, for load-based licensing the “expected levels of abatement (and therefore associated costs) are key unknowns and
difficult to predict with any degree of confidence" (EPA [NSW] 1998). Hamilton, Hundloe and Quiggin (1997, Section 6.3) suggest that existing systems of load-based licensing appear to provide “significant motivating factors in reducing pollution”. However, the low level of charges relative to international standards raises a question mark over this comment and leads to the expectation that the influence of load-based licensing fees on capital investment decision-making will be small.

Although the schemes discussed above have been in operation since the early 1990s, there is a void in the literature on the effect of these emission charge schemes from the perspective of their impact on capital investment decision-making. However, Verbeke and Coeke's (1997) survey of the responses of firms to Belgian eco-taxes gives some insight into possible financial effects of environmental taxes and charges. Belgian firms perceived the environmental taxes as primarily a means of increasing income for government rather than as a legitimate means of environmental improvement.

Verbeke and Coeke's (p.513) study indicated that managers perceived the following problems:

- Lack of predictability of both environmental tax levels and environmental physical regulations (45% of respondents).
- Non-availability of pollution reduction technologies (35% of respondents).
- The environmental taxation system was negative in terms of international competitiveness (65% of respondents).
- Many firms had concerns that environmental taxes were lower in neighbouring countries and virtually all firms perceived the presence of a vicious cycle.
Verbeke and Coeke (p.513) concluded that public policy makers do not appear to sufficiently appreciate the direct and indirect costs borne by business firms and that environmental taxes in Belgium do not have a positive impact on pollution reduction. They suggest (p.507) that an environmental taxation system may lead to an unintended reaction of the affected firms – a reduction in willingness to respect and support public environmental policies. They feel that this may occur if a system of environmental taxation leads to perverse incentives and cheating behaviour and note (p.507) that:

This unintended outcome may be achieved if firms perceive that every time they respond positively to the carrot (i.e. they reduce their pollution in order to benefit from a reduction in taxation), a new and heavier stick is introduced by government in order to maintain its existing or desired level of income.

Despite these concerns, Verbeke and Coeke, concede that environmental taxes are superior to conventional physical regulations and have the advantage of allowing managerial choice – firms can choose to pay the taxes and bear the cost of compensating society for the external costs suffered (this is the stick effect). This case illustrates the importance of understanding the effects of pollution charges.

The impact that pollution charges will have on firms depends upon the level of the charges, the amount of abatement required and the net cost of undertaking that abatement (EPA [NSW], 1998, p.53). The low level of charges for emissions taxes in Australia suggests that adverse reactions from Australian firms are unlikely. However, it also gives rise to the expectation that these charges will do little to influence investment in less polluting capital equipment. The effect of Australian pollution charges on capital investment has not yet been investigated and so will be included in the empirical study.
2.2.3 Assessment

The literature on the effect of emission charge systems is in an early stage of development. There is a scarcity of literature on the perceptions of firms affected by the emission charge schemes and work from the Australian perspective has yet to be presented. Likewise, no work has been done which specifically examines the effects of emission taxes and charges on the capital investment decision-making of the firm.

Around Australia, state EPAs are introducing user pays pollution charge systems. However, the expected level of abatement achieved as a result of these schemes, is noted by EPA (NSW), (1998) to be difficult to predict with any degree of confidence. The literature dealing with these schemes is limited and provides no indication of whether pollution charges are sufficient to drive firms towards increased spending on pollution-reducing capital investment. However, the low level of these charges leads to the expectation that the effect will be small. There is a deficit in the literature on the relationship between pollution charges and capital investment decision-making which will be addressed by this thesis’s research objectives.

2.3 Subsidies

Subsidies are forms of direct financial assistance such as grants and interest free loans and indirect financial assistance such as depreciation allowances and other tax concessions (Barde and Smith, 1997). Research on the relationship between subsidies and investment in more pro-environmental capital investment is scarce. However, subsidisation has fallen into disfavour because in the past many subsidies have had economic objectives (such as to
promote the supply of energy) which compete with environmental goals. For this reason the OECD (Potier, 1998) views subsidies as financial support to production or consumption of environmentally damaging products and rejects their use.

However, the OECD’s assessment of subsidies fails to take account of possible advantages. It appears that little consideration is being given to the use of (or research on) subsidies to promote environmental benefit. Potier (1998) notes that this work is made more difficult because there is no commonly accepted definition of a subsidy. The study of subsidies in this thesis is limited to those with the specific objective of environmental improvement.

2.3.1 Use of Subsidies in Australia

Subsidies are not extensively used in Australia. Subsidisation for pollution avoidance or reduction is principally through the tax system in the form of concessional tax treatment. Conservation costs are only deductible for land that is also used for business purposes or farming (Binning and Young, 1999). EPAs and some other government bodies offer grants for environmental initiatives, such as waste management and conservation. However, these require an initiative from the entity and awareness of the scheme. An examination of the list of grants awarded by the NSW EPA over the last four years\(^{16}\) showed that the majority had been awarded to local councils, schools and universities, and that few had gone to private companies.

2.3.1.1 **Environmental Tax Concessions:**

Environmental impact expenditure and environment protection expenditure is dealt with in Division 400, Part 3-45 (1997) of the *Income Tax Assessment Act (1997)*. Concessional tax treatment is provided by allowing immediate deductibility for expenditure incurred for the sole or dominant purpose of carrying on environmental protection activities (section 400-55).\(^\text{17}\) However, capital investment for the purpose of preventing or reducing pollution may not qualify for depreciation allowances if the investment is not income producing. Therefore, to enable firms to depreciate pollution preventing or reducing capital investments, Section 400-100 treats property used for environmental protection activities as if it were used for the purpose of producing assessable income (provided the expenditure relates to an income-producing activity or business activity) (Woellner, Barkoczy, Murphy and Evans, 2001).

Deutsch, Fullerton et al (2001, p.578) explain that this has the effect of bringing "capital expenditure on buildings used for environmental protection purposes within the net of Div. 43, provided that capital expenditure meets the other tests of the division". Buildings and earthworks for environmental protection thus qualify under Div. 43 for concessional tax treatment. However, the concession is very small (depreciation within the range of 2.5% to 4%). Capital expenditure on environmental plant and equipment is deductible only at the same rate as for investments in plant and equipment used in income producing operations.

\(^{17}\) Environmental protection activities resulting from earning activities are defined in subsection 400-60(1) as activities to "prevent, fight or remedy pollution of the environment; or treat, clean up, remove or store waste."
The Influence of Environmental Social Controls on the Capital Investment Decision-Making of the Firm: Australian Evidence

The Australia and New Zealand Environment and Conservation Council (ANZECC) (1998) is critical of the lack of incentive in the deductions allowed by the Australian Tax Office. However, they add (p.75) that “it must be noted that these existing concessions have not been widely promoted and so their effectiveness has not been fully tested”.

2.3.1.2 Direct Subsidies

ANZECC (1998, p.78) comment on the value of direct subsidisation:

Direct financial support is likely to be more cost-effective than tax expenditures or subsidies where targeting is difficult, and it is necessary to ensure that the support is spent on the purpose for which it has been provided. A grant, concessional loan or equity investment allows every claim to be examined. Direct financial support is also appropriate in those circumstances where governments want to be certain about the budgetary impact of the programs.

The Victorian Cleaner Production Program provide grants and no interest loans for cleaner production investments by small to medium firms. An initiative by the EPA (South Australia)'s Small Business Pollution Prevention Project has also provided consultancy grants and interest free loans for the purchase of new technology and equipment for small to medium businesses. The project seeks out and targets small firms and offers workshops and assistance in making environmental improvements.

The value of consultancy grants is illustrated in the case of the South Australian Brewing Company (SAB).\textsuperscript{18} The relatively small outlay by the EPA (maximum $15,000) aided the firm to make significant cost savings and reductions in pollution. The consultancy grant was provided to examine brewing, packaging and handling processes. As a result SAB implemented the following changes:

\textsuperscript{18} The source of the two case studies discussed as well as many others is the South Australian EPA site: http://www.dnr.sa.gov.au/epa/wastepaper.html (15/7/2001)
- Minimisation of filling losses saving 200,000 litres of beer annually at a resulting annual saving of $100,000.

- Recovery and reuse of extract from earlier production stages resulting in an annual saving of $42,000.

- Water reclamation system reducing water costs by $60,000 annually.

- Upgrade of storage and handling systems, such as replacement of extended pipe runs and manifold systems to reduce cleaning resulting in savings of $55,000 annually.

An investment of about $230,000 in equipment and modification resulted in a net annual saving in excess of $250,000.

Another case study illustrates the value of the interest free loans (maximum $50,000) provided by the EPA. A South Australian printing company Cutler Brands was provided with an interest free loan of $22,529 to part-fund the installation of equipment to clean screens and stencils used in the screen printing process. Outcomes of the new technology include:

- Recycling of solvent reduced its usage by 9,000 litres annually at an annual cost saving of $6190.

- Reduction in the number of ink soaked rags to dispose of at an annual cost savings of $3740.

- Improved Occupation, Health, Safety and Welfare conditions for operators due to the reduced use of solvents.
- Print machine downtime has been reduced by 1,950 hours per year resulting in an annual saving of $105,000.

- Additional earning capacity without additional labour cost equates to $25,000 annually.

- Improved gross profits from capacity increase $25,000 annually.

Cutler Brands' total one-off outlay of $45,000 (including the EPA loan) realised a net annual saving of $164,930.

The success of this scheme raises a question mark over the approach of the OECD in rejecting the use of environmental subsidies. The two case studies discussed above were chosen from about twenty similar cases, all successful in aiding small firms to significantly reduce pollution as well as costs. The cost of the scheme is offset by savings to the community through reductions in environmental damage, health problems and policing of firms. ANZECC (1998, p.78) makes a number of suggestions for increased use of subsidies in Australia. These include expanding the availability of low interest loans schemes to encourage SMEs to adopt cleaner production.

### 2.3.2 Costs and Benefits of Subsidies

In Australia, tax concessions have not always been set with regard to environmental consequences according to Dodds (1999). He points out (p.15) some deficiencies related to their use:
...the incentive provided is unlikely to be set at the optimal rate, as most tax concessions rely on standard features of the host tax, such as normal depreciation allowances rates for particular types of expenditure, or the tax rate schedule in the case of indirect taxes. Furthermore, tax incentives incorporated into the income tax system are only of value to individuals or firms who are able to set the deductions against taxable income. This results in incentives that are linked to the structure of the tax system and the tax status of the individual, rather than to the environmental characteristics of the target activity.

Discussion of the optimal level of tax concessions is limited in the literature to economic projections. There is an absence of Australian research evidence to confirm the accuracy of these projections, leaving open the possibility that the current level of subsidisation is a cost with insufficient benefit. Research from the USA fuels this concern. Davis and Swenson (1993, p.483) used an experiment to investigate "whether capital investment increases when depreciation or investment credits allowed by the tax system result in more rapid deductions than true economic depreciation". They found that “[d]emand was unresponsive to tax incentives because the prices of depreciable assets were bid up. That is, tax benefits were captured to some extent by factor suppliers”.

The psychological implications of economic incentives are considered by Lockhart (1997, p.225) and Thorgersen (1994, p.407). Lockhart notes that subsidies reward good behaviour, resulting in an atmosphere of cooperation, whereas taxes are a punishment for bad behaviour, which may promote resentment and develop tolerance to punishment. Additionally, if environmentally sound behaviour results in unexpected benefits such as cost reduction due to reduction in waste, the decision-maker may be motivated to continue the desired behaviour.

The use of tax subsidies is suggested by Lockhart (1997) as a possible alternative or adjunct to environmental taxes and charges which would be more readily accepted. She raises (p.220) some questions to be addressed to determine whether subsidies are reasonable mechanisms for environmental change. These include inter alia:
• Whether tax subsidies can stand alone or be used in conjunction with other policy tools such as taxes and charges?

• Whether tax preferences can be effective in changing behaviour to actions aimed at environmental protection?

Rae (1997) considers that subsidies and tax concessions can encourage improved environmental performance and provide flexibility in the choice of how the improvements are made. However, he points out some shortcomings of environmental subsidies. Firstly, they do not satisfy the polluter pays principle and may instead reward poor environmental performers. Second, they must be funded by increased taxes or cuts in other government programmes.

In the USA, 80% of state governments offer environmental subsidies to encourage (for example) water pollution control, recycling and alternative energy investments. Businesses may move from one state to another if they perceive that regulation creates a competitive disadvantage, relative to other states. This is a major reason for the use of subsidies rather than taxes to encourage environmental compliance. 19

Additionally, subsidies have been found to be more effective in certain situations, such as in controlling non-point sources of pollution such as pesticide and fertiliser run-off which are difficult to monitor. Subsidies have provided the incentive to farmers, firms with old equipment, low profit and new firms to invest in environmentally sound processes and equipment that they might otherwise be unable to afford - especially if the investment has the potential to save money (Lockhart, 1997).

19 Although direct subsidies are not used extensively in Australia, it might be suggested that hidden subsidies exist in the form of low level pollution emissions charges. One possible reason for these low level charges may be this fear of losing industries to other states.
2.3.3 Assessment

Literature on the use of subsidies to influence environmental decision-making is in an early stage of development. Lockhart’s (1997) overview of the use of subsidies in the USA includes an evaluation of their effectiveness in comparison to other economic instruments. She also questions whether they may be used as an adjunct to other economic instruments. Whilst this work is a significant contribution to our understanding, it does not extend to consideration of the effect of subsidies on the decision-making of the firm.

Questions relevant to this thesis but not addressed by the extant literature are raised by Lockhart. These are (1) whether tax subsidies can stand alone or can be used in conjunction with other policy tools such as taxes and charges? and (2) whether tax preferences can be effective in changing behaviour to actions aimed at environmental protection? However, the evaluation of environmental subsidies requires examination of issues not raised by Lockhart. These include:

- the level of awareness of firms about subsidisation;
- the level of subsidisation required to influence firms in their capital investment decision-making.

Currently used methods of subsidisation (such as depreciation allowances) may provide little incentive to firms to improve their environmental performance. For small firms which cannot afford capital outlay without a relatively short payback period, subsidies may make environmental improvement possible. There is little in the literature to indicate the success of taxation subsidies as an influence on capital investment decision-making.
The effect of environmental taxes described by Verbeke and Ceeke (1997), is in striking contrast to the effects of the use of subsidies in the USA (Lockhart, 1997) and by the South Australian EPA. These subsidies have been successful in promoting pro-environmental behaviour without causing the adverse reactions which may result from the imposition of taxes. These have in some instances been used in conjunction with a tax or charge which funds the subsidy. It appears that subsidies are an under-used resource. Whilst subsidies may not be an appropriate tool in every situation, they have been shown to be effective in some cases as an adjunct to or an alternative to taxes and charges.

It has been suggested that economic instruments work best as part of an integrated strategy (Barde and Opschoor, 1994). Barde and Owens (1996, p.16) comment:

It is clear, though, that environmental policy in general has a potential impact on trade and competitiveness; eco-taxes are only one of the instruments applied. It is the compound effect of the mix of policy instruments – regulations, tradeable permits, and so on – that matters...

Buckley (1991) suggests that large reductions in pollution levels usually require large capital investments and that private corporations will seek to minimise capital investments, preferring instead higher operating costs. The literature indicates that whether this is true may depend upon the nature and extent of the 'financial pain' inflicted upon them by the economic instrument. Possibly the use of subsidies may be a more effective incentive than financial pain (especially for SMEs). Certainly this appears to be the case for firms involved in the South Australian EPA Small Business Pollution Prevention Scheme. However, little attention has been paid to this possibility in the literature.

The comparison of taxes and charges with subsidies, serves to illustrate the differing effects which may be achieved by their use. There is a deficit in the literature on each of the economic instruments addressed in this study, which fails to address empirically the relative
merits in the use of various instruments. Also missing from the literature is empirical research on the specific influence of each of the economic instruments on the capital investment decision-making of the firm.

2.4 The Influence of Stakeholder Opinion

It is posited that the response of capital investment managers to the influence of various groups of stakeholders depends on their disposition and is reflected in the firm’s response to: (i) various groups of stakeholders; and (ii) the need for social perceptions of its legitimacy. The questions raised by the literature on stakeholder theory, which are significant to this thesis are:

- Who (or what) do firms perceive to be stakeholders?
- How (and to what extent) do various stakeholder groups influence the firm’s environmental performance?

These two questions will be discussed in the following sections.

2.4.1 Who is a Stakeholder?

Mitchell, Agle and Wood (1997, p.855) note that “(p)ersons, groups, neighborhoods, organizations, institutions, societies, and even the natural environment are generally thought to qualify as actual or potential stakeholders”. They suggest that Freeman’s 1984 definition “leaves the notion of stake and the field of possible stakeholders unambiguously open to include virtually anyone”. Mitchell et al (p.855) see this wide view of stakeholders as unsatisfactory and put forward a “theory of stakeholder identification and salience”.

65
Mitchell et al's (p.855) theory is based on the assumption that stakeholder classes can be identified by their possession of one or more of the following attributes:

(1) The power\textsuperscript{20} to influence the firm;

(2) The legitimacy of the stakeholder's relationship with the firm; and

(3) The urgency of the stakeholder's claim on the firm.

However, Mitchell et al suggest (p.869) that:

\ldots latent power exists in stakeholder relationships, and the exercise of stakeholder power is triggered off by conditions that are manifest in the other two attributes of the relationship: legitimacy and urgency. That is, power by itself does not guarantee high salience in a stakeholder-manager relationship. Power gains authority through legitimacy, and it gains exercise through urgency.

Mitchell et al (p.872) conclude that managers who want to achieve certain ends pay particular kinds of attention to various classes of stakeholders. The salience of stakeholders is based on manager’s perceptions of the attributes possessed by the stakeholder. Thus stakeholder salience will be low where only one of the attributes is perceived to be present. This view is consistent with the findings of Nasi, Nasi, Phillips and Zyglidopoulos (1997, p.317) who found that companies were “clearly extremely sensitive to their major stakeholders. Issues addressed were connected with stakeholder groups that applied consistent pressure”. They note that “[i]t seems clear that when it comes to issues management “the squeaky wheel gets the grease,” and even more, “the loudest squeak of the most important wheel gets the most grease”.

This view of managers' responses to stakeholders is further supported by the finding of Agle et al (1999) that urgency is the best predictor of stakeholder salience. Although the companies studied improved their environmental performance over time a period of

\textsuperscript{20} Mitchell et al rely on Salancik and Pfeffer’s (1974, p.3) view of power: “it is the ability of those who possess power to bring about the outcomes they desire.”
reduced attention to environmental issues was noted to occur during an economic
downturn.

An Australian study (Tilt, 1997) supports the view of Mitchell et al indicating the differing
levels of influence of various stakeholder groups on the firm’s environmental performance.
Tilt found (p.381) the following groups to be of influence (in descending order)
(i) government, (ii) public, (iii) consumers, (iv) insurance companies, (v) shareholders,
(vi) lobby groups, banks, suppliers and the media. She comments (p.382) that:

This is particularly interesting as studies have shown that lobby groups are extremely active
in attempting to influence companies’ activities (Tilt, 1994), yet are ranked as the group
having least influence by companies themselves. On the other hand, the ‘Public’ was
ranked second to only the government. This may be an indication that respondents are mis-
perceiving their environment, or it may indicate that companies consider the influence of
public opinion generally to be more important than the actions of individual groups within
the general public.

Wilmshurst and Frost (2000) also found the influence of environmental lobby groups on
environmental performance to be low. Agle et al’s (1999) study differs from that of Tilt in
that shareholders, employees and customers were noted (p.520) to be more salient than
governments and communities. Government salience was found to be negatively related to
corporate performance, which Agle et al consider as confirming “a traditionally reactive
posture toward government”. They add (p.521) that “CEOs would appear to be saying ‘If
we’re doing poorly with diversity, environmental performance, product liability, and so
forth, government is all over us’ ”.

An important point raised by Donaldson and Preston (1995, p.86) is that “managers are,
themselves, stakeholders, - and indeed a very privileged class of stakeholders - in the
enterprise.” It is most significant that managers are the stakeholders who are most in
control of resources which are critical to the organisation. Stakeholder-agency theory
suggests that managers will make decisions in a manner which is consistent with fulfilling their contractual obligation to shareholders (Shankman, 1999). Performance incentives serve to further align the priorities of managers with those of the owners of the firm. However, evidence suggests that these priorities might not drive managers towards more environmentally responsible decision-making (Stanwick and Stanwick, 2001).

2.4.2 How Do Stakeholders Influence the Firm’s Environmental Performance?

There are many possible responses of the firm to stakeholder pressure for improved environmental performance. Increased environmental disclosure is the response most focussed on by the literature. USA studies of environmental implications of capital budgeting carried out by the EPA (USA) (White et al, 1995; Boyd, 1998) provide an indication of the firm’s response to changing USA environmental law in recent years. The study by White et al (1995) questioned respondents about the effects of Superfund liability on various aspects of internal management decision-making in the area of capital budgeting. Responses indicated that:

- Superfund is considered in capital environmental project evaluation by only 32% of respondents.

- Superfund liability is regularly quantified by only 7 to 14% of respondents during project financial evaluation.

- Of those who consider liability, it is generally considered after financial evaluation is complete and a project is brought to upper management for final review and approval.

- The most frequently cited hurdle (58%) to quantifying liability is difficulty in estimating if liability costs will occur. Following this is the difficulty in estimating the magnitude of costs (45%) and when liability will occur (29%).
• Remarkably few considered that quantified data might lead to toxic torts (5%) or trigger a requirement to disclose to the SEC" (3%).

However, 61% of survey respondents felt that Superfund liability was important in determining priorities for environmental projects. White et al conclude that “the general appreciation of liability avoidance well exceeds concrete steps to quantify it.”

A significant factor in capital investment decisions is the high cost of capital equipment for some companies. Schmidheiny and Zorraquin (1998, p.64) cite a comment by an executive that: “[i]t is all right for 3M to prove that ‘Pollution Prevention Pays’; they make sticky tape. But it is harder to prove it if you are running an oil refinery or a steel mill”. This illustrates that changes in plant and equipment for industries such as steel and heavy chemicals are much more costly and consequently may be less frequent than for lighter industries. In such cases the influence of stakeholder opinion on capital investment decision-making may be less apparent.

2.4.3 Assessment

Research using stakeholder theory has focused largely on disclosure aspects of the firm’s response. Observations of increased spending on capital budgeting have been largely incidental to the main thrust of research on disclosure and environmental costing, such as the EPA (USA) studies discussed in section 1.3.1.

Little is known about the nature of the firm’s response in terms of actual improvements in capital investment decision-making. However, the research of Mitchell et al (1997) is consistent with that of Nasi et al (1997) who found that “companies were clearly extremely
sensitive to their major stakeholders.” Issues addressed were noted by Nasi et al to be connected with stakeholder groups that applied consistent pressure. White’s (1995) study illustrates the nature of a response by firms to a major stakeholder which could be considered to be applying consistent pressure. This stakeholder is the EPA (USA) which pursues firms for site clean-up under the Superfund law. Although White found that 61% of respondents rated Superfund ability as important in determining priorities for environmental projects, it was considered in capital environmental project evaluation by only 32% of respondents.

Given that Superfund liability is onerous, it would seem reasonable to expect it (and the EPA) to have much greater influence on capital investment decisions than is indicated by these findings. However, White’s findings also indicate that consideration is qualitative in many cases, due to difficulties in quantifying it. Thus, the extent of influence of both Superfund law and the EPA as a key stakeholder remains unclear.

2.5 Mandatory Environmental Disclosure

The literature indicates that the cost of mandatory environmental disclosure requirements influences the financial decision-making of the firm. The United Nations Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting (ISAR) (1991, p.100) gives an indication of the costs of environmental disclosure. The study mentions inter alia the following obstacles which discourage firms from taking or reporting environmental protection measures:
• Earnings per share are scrutinised by investors, so firms put off taking measures which would reduce income.

• Difficulties in separating environmental expenditures from others, especially in the case of investment expenditures.

The USA has lead the way in the development of environmental accounting standards, with the introduction of SOP 96-1 (discussed in section 1.2.3). Australia as yet has few mandatory disclosure requirements. An overview of these disclosure requirements follows in section 2.5.1. Section 2.5.2 examines the literature on the cost of disclosure to the firm. An assessment of the disclosure literature is made in section 2.5.3.

2.5.1 Environmental Disclosure in Australia

There is a general absence of regulation requiring firms to make public disclosure of information about their environmental performance (Nash and Awty, 2001, p.28; Institute of Chartered Accountants Australia (ICAA), 1998, p.4). However, research indicates that there is a demand for this information. Principal environmental disclosure requirements include accounting disclosures, Corporations Law requirements for disclosure in the Directors’ Report and disclosure about pollutant emissions in the National Pollutant Inventory. Discussion of these three key areas of disclosure follows.

2.5.1.1 Accounting Disclosures

Hainsworth (1996) identifies an “expectation gap” between users and preparers of financial statements. Research on the environmental disclosures of Australian companies shows it to be inadequate and self-serving (Gibson and Guthrie, 1995; Deegan, Geddes and
Staunton, 1995; Deegan and Gordon, 1996). Research from other countries shows similar behaviour elsewhere. Freedman and Jaggi (1996) concluded that inconsistency between disclosure and performance is probably encouraged by lack of meaningful environmental disclosure requirements.

An Australian study of the relationship between pollution performance and pollution disclosure (Deegan and Rankin, 1996) concluded that firms appear reluctant to provide negative environmental information in their annual reports. A group of firms which had been prosecuted by the EPA were found to provide significantly more positive disclosures than firms which had not been prosecuted. Deegan and Rankin (1996, p.59) comment that:

Such a finding is consistent with a view that those firms which have been prosecuted believe that there is a need to counter the negative news of their prosecution with positive news about their environmental initiatives. That is, it appears that they believe there is a need to legitimise the existence of their operations, the legitimisation endeavour taking the form of increased disclosure of positive or "good" environmental news.

The companies interviewed by Wood (1998) reported an absence of demand for environmental information (see also Gray, 1994) and reduced demand for annual reports. Managers interviewed indicated a dislike of discretionary elements in accounting requirements. Managers at all levels felt that costly changes to the accounting system would be required in order to track environmental costs and liabilities and did not think that benefits would flow from these added costs.

Australian managers who have influence on the nature of annual report environmental disclosures were interviewed by O'Donovan (1999). He concluded that managers use the annual report as a way of educating the public and correcting public misconceptions arising from negative environmental publicity. However, five of the seven managers
interviewed stated that "a consideration of what users wanted to see had little effect on what environmental information would be disclosed in the annual report."

However, it would appear from the Deegan and Rankin (1996) study, that Australian companies believe there is a relationship between positive environmental disclosures and profitability. This indicates the potential power of mandatory disclosure requirements. It is likely that firms which must make 'bad news' environmental disclosures will feel pressured to improve actual rather than just stated performance.

Australia as a consequence of the International Harmonisation Policy\(^{21}\) has recently followed the introduction of IAS 37 "Provisions and Contingencies" with a new standard AASB 1044 "Provisions and Contingencies." This standard discusses the nature of provisions and contingencies and prescribes when they should be recognised. Although environmental liabilities would frequently fit the definitions of provisions or contingencies provided in AASB 1044, there is no specific requirement for separate disclosure of environmental liabilities.

The Auditing Guidance Statement (AGS) 1036 on Consideration of Environmental Matters in the Audit of a Financial Report was issued in 1998. It concerns the assessment of the risk of material misstatement of the financial report due to environmental matters. The auditor's responsibility is stated to lie in planning the audit so that this inherent risk is assessed at the financial report level. The production of an AGS on environment is an indication of the growing importance of environmental liabilities and concern that the risk of such liabilities occurring may be materially misstated. It might be argued that if auditors

\(^{21}\) As set out in Policy 6 in the Australian Accounting Standards Handbook, the Australian Accounting Standards Board (AASB) is working with the International Accounting Standards Committee and various other standard setting bodies to improve international comparability of financial reporting.
need specific guidance on environmental disclosures, the preparers of financial reports also need guidance in the form of an accounting standard for the separate disclosure of environmental liabilities.

2.5.1.2 Corporations Law Requirements

Disclosure on compliance with environmental regulation is required in the Directors’ Report through the Corporations Law Review Act 1998 s299 (1)(f). Although the Australian Securities and Investments Commission (ASIC) (1998) has issued some general guidelines, the wording of the section was badly drafted leaving many uncertainties in regard to the interpretation of the requirements (Bubna-Litic, 2000, p.3; Nash and Awty, 2001, p.31).

Australian Securities and Investments Commission (ASIC) (1998) provides the following guidance on the requirements of s299(1)(f):

(a) Prima facie, the requirements would normally apply where an entity is licensed or otherwise subject to conditions for the purpose of environmental legislation or regulation.

(b) The requirements are not related specifically to financial disclosures (e.g. contingent liabilities and capital commitments) but relate to performance in relation to environmental regulation. Hence, accounting concepts of materiality in financial statements are not applicable.

(c) The information provided in the Directors Report cannot be reduced or eliminated because information has already been provided to a regulatory authority for the purposes of any environmental legislation.
(d) The information provided in the Directors' Report would normally be more general and less technical than information which an entity is required to provide in any compliance reports to an environmental regulator.

ASIC's comment indicates that disclosure of breaches of regulation or prosecution cannot be avoided on the grounds that it is not material or that information has already been provided to the EPA. However, as Keogh (1999, p.9) comments, the real effects of s299(1)(f) are as yet unknown:

...to what degree will the obligation to report an "entity’s performance in relation to environmental regulation" impact on corporate risk management practices within Australia? For a start it is a question of what is reported and what action is subsequently taken by directors as a result of adverse publicity by way of s299(1)(f) disclosure.

In this thesis the question raised is "to what degree will s299 (1)(f) impact on environmental capital investing decision-making of firms?" As yet this question remains unanswered in the literature.

2.5.1.3 National Pollutant Inventory (NPI)

The NPi22 is an Internet database designed to provide the community, industry and government with information on the types and amounts of certain chemicals being emitted to the environment (Environment Australia, NPi Update, 1999). It was implemented by Commonwealth, State and Territory governments of Australia.

Data from the NPi first became available in 2000 and firms must report on their emissions of 90 substances, if they are above a minimum level. Manuals have been produced for each industry to aid firms in estimating levels of their emissions. The database is available to members of the public and may be searched by pollutant substance, industry, facility or

22 The NPi may be accessed at http://www.environment.gov.au/net/npi.html
geographic area. Contextual information has been included to enable users to understand the information on emissions and at what level they are harmful.

Purposes of the NPi include provision of information to members of the public on both point sources of emissions in their local area and diffuse sources such as nutrient emissions or pollution from motor vehicles. A further purpose is to make companies more accountable and provide an incentive for cleaner production, as facilities (and members of the public) can compare their performance with others in the same industry. As yet only 3000 to 5000 Australian companies are required to report emissions and inventories for specific chemicals (KPMG Australia, 8/5/01). The extent to which this public disclosure requirement influences firms towards investment in new technology and cleaner production has not been investigated in the literature.

2.5.2 The Influence of Disclosure Requirements on Capital Investment Decisions

This section examines the literature on the impact of environmental disclosures on the firm's decision-making. First section 2.5.2.1 discusses the impact on the market value of the firm. This is followed by a discussion of costs of borrowing in section 2.5.2.2.

2.5.2.1 Capital Market Valuation

The impact of accounting reports on decision making was discussed by Zeff (1978) who points out that:
Companies that are sensitive to the way their performances are evaluated through the medium of reported earnings have permitted their decision-making behavior to be influenced by their perceptions of how such behavior will be seen through the prism of accounting earnings. Still other such companies have tailored their accounting practices to reflect their economic performances in the best light – and managers are evidently loath to change their decision-making behavior in order to accommodate newly imposed accounting standards.

Although this statement was made more than twenty years ago, more recent research (Deegan and Gordon, 1996; Deegan, Geddes and Staunton, 1995) indicates that it is still relevant, especially to environmental concerns. The importance of economic factors, illustrated by Arlow and Gannon (1982) is similarly still relevant today. They conclude that “economic and financial goals dominate goals related to social responsibility”. These concerns about economic and financial goals are a probable reason for the lack of correspondence between actual performance and pollution disclosures discussed in the previous section.

The American Accounting Association (AAA), Financial Accounting Standards Committee (1998, p.196) suggest that there is a cost associated with failure of firms to disclose reliable information:

Research findings suggest that the capital markets react negatively to the existence of uncertain potential obligations of firms. However, the capital markets react less negatively when firms are voluntarily forthcoming with reliable information about uncertain potential obligations. In contrast, users react more negatively to firms with comparable obligations that are not forthcoming with reliable information. The implication for standard setting is that adverse consequences in capital markets are more severe for firms that do not provide informative accounting data regarding provisions and contingencies.

The emerging situation in Australia is summed up in the following comment by Girardi (1999, p.42):

Investors are becoming increasingly concerned with corporate environmental performance. Companies with a poor record of environmental performance may find it difficult to obtain the necessary resources and support to continue operations within a community which values a clean environment. Poor environmental records can impact on a credit rating given by ratings agencies, as companies can be downgraded in the light of their anticipated liabilities and risk.
Nash and Awty (2001, p.26) support this view noting that:

The finance and insurance sector is increasingly integrating environmental elements into its activities. This change includes assessing the environmental risks with business loan applications; offering investment funds that favour environmentally and/or socially responsible companies; and altering insurance premiums based on environmental risk.

However, Descano (1999, p.24) questions the extent to which this is true and notes that research evidence indicates that few investment professionals understand how environmental strategies enhance financial performance.

Logic suggests that firms will be pressured to make more pro-environmental capital investment decisions, by mandatory ‘bad news’ disclosures. However, the above evidence is conflicting and leaves uncertainties regarding the extent to which analysts and investors will be influenced by disclosures without a proper understanding of their significance.

2.5.2.2 Cost of Borrowing

The United Nations Environment Program at the 1992 Conference on the Environment and Development (the Earth Summit), presented “A Statement by Banks on The Environment and Sustainable Development.” By 1995, sixty-five financial institutions (mainly in Europe and Canada) were signatories to the agreement that “environmental risks should be part of the normal checklist of risk assessment and management.” (White, 1996, p.204). Growing costs of environmental remediation can only serve to assure an increasing awareness of environmental risk by creditors.

An Australian project of the Mineral Policy Institute (Wright, 1998, p.3) evaluated existing social and environmental policies and practices in the finance sector. The findings indicate that 45% of respondents (ie. banks, insurers and export-import credit agencies) have a
policy regarding environment and social issues in giving out loans. However, it is less common for there to be any screening or monitoring on the environmental effects of projects. Currently in Australia there is no obligation for banks or insurers to incorporate environmental considerations into projects they underwrite (Wright, 1998, p.3). However, Girardi (1999, p.47) notes that:

...the banking and insurance sector are increasingly incorporating environmental risk into their risk assessment processes. As the financial sector plays a crucial role in business activities through providing loans and insurance, this is emerging as a key driver, requiring that organisations can demonstrate effective environmental performance and environmental risk management.

More recent reports (Grant, 2001; A’Hearn, 2001) note the growth and success of socially responsible investment funds, which may indicate increased awareness of the importance of environmental issues both by fund managers and individual investors. The Australian Eco-Share Fund (AESF) is an initiative supported by superannuation funds HESTA and Unisuper, which Grant notes has outperformed most other superannuation funds during the same period. This strong performance by firms suggests that good environmental performance is rewarded by improved profitability.

A similar view is expressed from an Australian analyst’s perspective by Descano (1999, p.24) who notes that “lenders and insurers, who are concerned about containing risk, are becoming highly aware of environment-related policies and issues that affect the particular companies with which they deal”.

A study of UK banks (Thompson, 1998b) suggests that UK banks are becoming increasingly aware of environmental risks. Thompson suggests that “companies which reduce their environmental impacts are likely to be favoured by the markets... because of the obvious positive financial implications of environmental risk minimisation, through effective environmental management systems and policies”. 79
Benefits for lenders are reduced credit risks and loan losses. Although UK banks are, for the most part, not yet actively targeting good environmental performers, there is an emerging trend towards in-depth risk assessment. An example is Lloyds TSB which has introduced environmental consideration into its assessment of both customer creditworthiness and its own performance (in property, purchasing, transport and waste management areas) (A’Hearn, 2001). This trend towards increased concern about environmental performance by lenders suggests opportunities for increased availability and lower cost of borrowing for firms with good environmental performance.

Similar concerns exist in the insurance industry, which must deal with both the cost of clean up of polluted sites and with the possibility of disastrous consequences of climate change in the future. Schmidheiny and Zorraquin (1998, p.118) point out the power of insurers to influence decisions of firms they insure:

- First, these individuals have large amounts of cash from premiums, which they invest in the financial markets. Second, in their roles as consultants to the companies they insure, they can influence approaches to environmental management. Third, they can increase business costs by insisting on high premiums for risky activities, and thus they can help change our views on what is risky. And fourth, insurers can and do refuse to insure certain risks, such as gradual pollution.

A’Hearn (2001, p.35) cites the example of Gerling Global Re which “has designed its premiums to reward companies with environmentally sound methods.” However, environmental insurance is becoming more affordable (Amore, 2000). Amore points out that insurance can cap environmental liabilities which may arise from mergers and acquisitions but that finance becomes more readily available when banks know that an insurer will cover unforeseen environmental liabilities.
2.5.3 Assessment

Research evidence suggests that there is little correspondence between pollution disclosures and actual pollution performance. Firms are reluctant to make public any negative environmental information and seem to link positive environmental disclosures with profitability. Reasons for the reluctance of firms to make negative environmental disclosures are indicated in the literature, and suggest that costs of disclosure are a major factor. USA literature suggests a cost of negative environmental disclosure in terms of a market reaction, and the limited Australian literature is consistent with this notion. Banking literature suggests a trend towards increased interest in the environmental performance of firms. Evidence suggests that firms with poor environmental performance records will be penalised by higher costs of credit and greater difficulties in obtaining credit. Little is yet known about the extent of influence of these penalties in capital investment decision-making and will be investigated in the empirical work of this thesis.

The literature discussed above provides evidence of the pressure brought to bear on the firm's finances by key stakeholders, namely shareholders, creditors, and investors. The response of the firm largely focused on in the literature is the disclosure response. Evidence from the disclosure literature suggests that the main response of the firm to this pressure is a legitimization response (in the form of positive disclosures). However, little work has been done to test the relationship between stakeholder opinion and actual environmental performance improvements. The empirical work of this thesis includes testing the influence of disclosure requirements, which is a first step towards filling this gap in the literature.
More specifically, the influence of stakeholder opinion on capital investment decision-making has not yet been investigated. It might be speculated that the recent introduction of a National Pollutant Inventory in Australia will increase pressure on firms to make negative disclosures. Failure to disclose information which is available in this inventory would damage the credibility of the firm. The literature is deficient in identifying the impact of this recent initiative on Australian firms. The influence of the NPI on capital investment decision-making will be tested in the empirical phase of this thesis.

Mandatory requirements for firms to disclose negative environmental information such as prosecutions, liabilities and contingent liabilities can be expected to put pressure on the firm to improve its environmental performance. The recent introduction of a requirement in s299 of the Corporations Law, for directors to report on the performance of the company in relation to environmental regulation is the first step towards making companies more accountable. There is little indication of how companies will react to this requirement or the impact it will have on them. The literature suggests that poor environmental performance has significant costs to the firm and it may be inferred from this that mandatory environmental disclosure will put significant pressure on firms to improve their performance. The influence of disclosure requirements in the Directors’ Report will be measured in the empirical work of this thesis.

Australia has more extensive environmental disclosure requirements for the extractive industries. It may be speculated that environmental disclosure will influence the extractive industries more than other industries because of these additional requirements. However, the influence of environmental disclosure requirements on the capital investment decisions of extractive industry firms (or firms from other industries) has not yet been examined in the literature.
There is little evidence of the precise effects of mandatory disclosure requirements on capital investment decision-making. To address this deficit in the literature, the influence of mandatory disclosure requirements of the National Pollutant Inventory, Corporations Law and Accounting Standards, will be investigated in the empirical work of this thesis.

2.6 The Moderating Variables

Many factors have the potential to influence firm environmental performance, as illustrated by the following comments from researchers:

...market power, firm size, industry structure, the competitive environment and the existence of a dominant design all play a critical part in deciding who will innovate and whether they will be successful (Hoffman, 1996, p.2).

Our theory lead us to believe that industry growth moderates the relationship between corporate social policies and performance. Might other variables also influence this relationship? The answer almost certainly is yes (Russo and Fouts, 1997, p.552).

However, the difficulty of isolating a single factor and measuring its impact on environmental performance is noted by Baylis, Connell and Flynn (1998b, p.285) who comment that “(i)t is not simply that firms respond to, or their behaviour can be explained by, a single factor... At times factors such as size and regulation, may reinforce one another ...”

Based on a review of the literature, it is posited that firm size, industry type and individual manager disposition are the moderating variables which have the most influence on firm’s response.23 The moderating variables in this study are factors which constrain the firm’s ability to respond to external pressures, such as environmental regulations, laws and

\[\text{23 It is recognised that factors such as corporate culture, industry growth and industry structure may also affect capital investment decision-making. However, their expected limited influence on capital investment decision-making have lead to their exclusion from the model.}\]
accounting standards. Section 2.6.1 reviews the literature on firm size. Section 2.6.2 deals with the effect of industry type and section 2.6.3 deals with literature on individual manager disposition.

2.6.1 Firm Size

There are many studies in which firm size is one of a number of variables empirically tested to determine its effect on the environmental performance of the firm. No studies have been found which specifically consider the relationship between firm size and the environmental aspects of capital investment decision-making. However, research evidence suggests larger firms are more environmentally conscious (Ahmed, Montagno and Firenze, 1998), better environmental performers and make more environmental disclosures (Hossain, Tan and Adams, 1994; Zhuang and Synodinos, 1997; Trotman and Bradley, 1981; Freedman and Jaggi, 1988; Patten, 1992) than small or medium size firms. This is believed to be because:

...large companies tend to have more resources at their disposal and thus can afford to spend more to make their product and processes environmentally friendly. But of course just because a company employs more people does not necessarily mean that it will or is willing to do this. The reason why they show more commitment may be due to public pressure because of their size. It is obvious that a larger employer attracts more public attention not just because it produces more and thus emits more pollutants but also because it can affect people both at and outside work should an environmental disaster strike (Zhuang and Synodinos, 1997, p.513).

Reichert, Webb and Thomas (2000) found a relationship between firm size and ethical and environmental policies and practices. They note (p.53) that "large firms are more inclined to invest in new ways to reduce production of various types of waste." However, some recent studies have indicated that the relationship between firm size and environmental performance may be more complex than earlier evidence indicates.
Small to medium sized enterprises (SMEs), because of their large numbers, contribute significantly to pollution. However, the combined environmental impact is not seen by most SMEs as the problem of any individual company (Rowe and Hollingsworth, 1996; Hillary, 1995). Baylis, Connell and Flynn (1998b) add that SMEs often fail to recognise the impact of their operations on the environment; have limited contact with regulators; believe that they cause little pollution and are too small to matter.

Low awareness of environmental legislation (especially in companies with fewer than 50 employees) is thought to be due to long hours worked by the owners and opportunity cost of attending meetings and courses (Petts, Herd, Gerrard and Horne, 1999). Government and other outside sources of information are commonly seen as an unwelcome constraint. Petts et al (p.28) conclude that SMEs perceive environmental regulation as poorly enforced and that there is “a lack of clarity amongst individuals in SMEs of what constitutes a non-compliant state.” They add that “while the majority of SMEs are not deliberately non-compliant they are vulnerable to this state particularly where there is a lack of awareness of, and empathy with regulation”.

Many SMEs will take simple actions such as reducing energy levels, recycling paper and undertaking waste minimisation programmes, but more complex improvements, requiring greater commitment or involving a more integrated approach to environmental management are not dealt with at a significantly early stage (Holland and Gibbon, 1997, p.8). Reduced business costs were found to be a key incentive which would lead to improved environmental performance (Rowe and Hollingsworth, 1996; Hillary, 1995).

The lack of an agreed definition is a problem in the use of firm size in studies. A further complication arises because researchers variously use number of employees, total sales or
income figures to make a distinction between small, medium and large firms. Thus, there are difficulties in making comparisons between empirical results using disparate measurement bases. Hutchinson and Chaston (1994, p.15) point out that SMEs “are not simply smaller versions of large companies” and that “an environmental solution applicable to a large multinational company may not have the least relevance to the corner shop in Barnsley”.

Bujaki and Richardson (1997, p.20) discussing the use of size as a proxy for other variables, conclude that:

…it is perfectly possible that the important variable is not really size at all, and that this has simply been a heading under which researchers lacking any sharper theoretical perspective have lumped many variables together.

Baylis et al (1998b, p.285) illustrate the difficulty in isolating the effects of variables:

…it at times factors such as size and regulation may reinforce one another and so lead to a clear direction of activity and a relatively uncomplicated line of analysis whilst, at other times, they may neutralize each other and thereby result in a lack of clear direction and difficulty in analysing what is happening.

Hutchinson and Chaston (1994, p.15) in their study of SMEs found that environmental issues were held to be significantly more important in the manufacturing sector than in the service or export sectors. This is consistent with findings of studies which encompass firms of all sizes. However, Hutchinson and Chaston suggest attempts to reduce environmental impacts in the SME sector may be aided by more detailed and less generic model developments for each sector, based on best practices. This suggests that size effects are likely to vary between industry sectors.
2.6.2 Industry Type

Industry type is often included along with firm size as a variable in many studies of the environmental performance or environmental disclosures of the firm. These studies were discussed in the previous section along with size and indicate a significant relationship between size and industry type and the difficulties noted above, in isolating the effects of the two variables. Hutchinson and Chaston (1994, p.15) feel there is a need for “understanding of the needs of particular sectors of industry” and also to “study the further link between attitudes and behaviour in different types (eg. sector, management style, corporate structure) of company.” As is the case with firm size, no studies have been found which specifically consider the relationship between industry type or sensitivity, and environmental capital investment decisions of the firm.

Reichert, Webb and Thomas (2000, p.35) found that “industries that utilise natural resources are more likely than other industries to have formal written environmental policies and practices.” Two studies (Adams, Hill and Roberts, 1998; Cowan, Ferreri and Parker, 1987) found that industry grouping and corporate size were significantly related to the decision to disclose environmental information. Deegan and Gordon’s (1996, p.197) study found that “only for companies operating in environmentally sensitive industries does a relationship exist between size and the amount of positive environmental disclosures”.

The perspective of managers about their industries was presented in Parker’s (1998) study. This study included interviews with managers of eleven companies, from various industries. Parker (p.38) found that managers were frustrated by the problems of communication in environmental reporting and believed that negative community perceptions can tarnish the company’s reputation “despite responsible management, comprehensive and frank
reporting, and development of co-operative relationships with related parties and community groups...”. This is especially the case when one company in an industry causes major environmental damage and attracts the attention of the media. One manager remarked (p.38) that:

…it doesn’t matter what good work we do,…we get stuck with the worst one in the pack. So all we can do in putting reports like this out is hope to chip away at the edges. We know its never going to be the answer, and while we still have bad players in our industry, we’ll get stuck with the worst of it.

Parker comments that “from this perspective, environmental management and accountability become an industry rather than a single company issue”.

Baylis et al (1998a, p.154) considered the attitudes of management and the environmental performance of firms in five industries. Their research findings included:

a) Industries which are close to end consumer markets (such as the food industry and the electrical sector) are more motivated by ‘good neighbourliness and public concern’ than the mechanical sector which supplies to other industries.

b) Personal concern for the environment was highest in the food sector and the chemical sector. The authors suggest that this may be related to sector circumstances. Food sector and the chemical sector employees perceive greater environmental impact than employees in less polluting industries.

c) The mechanical sector and the food sector often failed to recognise that they have harmful impacts on the environment. This was frequently related to the small size of the companies in these industries and a consequent lessening of regulation.

The literature suggests both that industry type is a significant variable and that there are significant differences between industries. Developing an understanding of the generic financial factors which influence environmental decision-making in all industries is a
necessary first step. However, understanding the unique financial factors affecting the environmental decision-making process in individual industries is also highly significant to the development of models which may aid in informing and predicting the decision process.

The research objectives of this thesis include an examination of the constraints on capital investment decision-making resulting from size and industry type. The point is taken that caution needs to be exercised in conducting empirical studies and interpretation of research findings, because of difficulties in making the distinction between the effects of size, industry sensitivity, regulation and other possibly unknown factors. It must be regarded as a limitation that knowledge is not yet sufficiently advanced to make clearer distinctions between industry effects and size effects.

2.6.3 Individual Manager Disposition

Individual manager disposition is explained by Davis-Blake and Pfeffer (1989, p.387) who note that “individuals possess unobservable mental states or dispositions (eg. needs, attitudes, or personalities) that are relatively stable over time and that determine, at least to some extent, their attitudes and behavior in organisations” However, they suggest that “it is unlikely that dispositional effects are as important as situational effects”.

Some pertinent questions about the nature of ‘green’ thinking are provided by Gladwin (1993, p.42):

Can corporate action precede green thinking, with green-oriented goals, preferences and rationality emerging from the action, rather than guiding the action? Are green attitudes and behavior so loosely coupled that firms may profess green ideals they do not follow or utter green platitudes without examining their validity? Relationships between cognitions, emotions and behavior are complex, elusive, and often very weak...
Measurement of individual managers disposition presents some difficulties for the researcher, because of the weak and elusive relationships noted by Gladwin. Davis-Blake and Pfeffer (1989, p.387) consider that “organizations are strong situations that have a large impact on individual attitudes and behavior” and that “individuals are highly responsive and adaptive to organizational settings.” For these reasons they conclude that “dispositions have only limited effects on individual reactions in organizations”.

It is posited that individual manager characteristics are likely to produce differences in their capital investment decision-making. Each managers disposition is posited to be multifaceted and the above literature indicates that the following facets are relevant to the managers response to environmental issues:

(a) Ethical stance;
(b) Organisational and psychological climate and
(c) Bio-data characteristics.

These facets of individual manager’s disposition are reviewed below.

2.6.3.1 Ethics and Decision Making

Studies by Fineman (1996, 1997) and Everett, Mack and Oresick (1993) provide contrasting views of managers, their beliefs and ways of dealing with environmental concerns. Fineman’s (1997, p.33) study of managers in the automobile industry provides a picture which he suggests “hints at how managers might be thinking”.

A common thread apparent in the studies of Fineman (1996, 1997) and Everett et al (1993), although not explicitly stated, is the strong ethical component of environmental decision
making. Cadbury (1987, p.72) commented that “openness and ethics go together” and “actions are unethical if they will not withstand scrutiny”.

Ford and Richardson (1994, p. 216) found that “the more ethical the climate and culture of an organization is the more ethical an individual’s beliefs and decision behavior will be”.

They further concluded (p.217) that:

...an individual’s ethical beliefs and decision making behavior will increasingly become congruent with top management beliefs as defined through their words and actions as rewards provided for compliance congruency are increased.

This corresponds with the view of Fineman (1996) on the importance of leadership to environmental decision making, that “lieutenants cannot wave the green flag alone”.

However, as Cadbury (1987, p.73) points out society must also accept some responsibility because:

Society sets the ethical framework within which those who run companies have to work out their own codes of conduct. Responsibility for decisions, therefore, runs both ways. Business has to take account of its responsibilities to society in coming to its decisions, but society has to accept its responsibilities for setting the standards against which those decisions are made.

This is particularly the case with environmental concerns. In its use of the products of industry, there is an implied acceptance of the processes (and pollution) ‘necessary’ to produce them.

2.6.3.2 Organisational and Psychological Climate

The importance of the influence of top management and of culture and climate, noted above, illustrates the need for individual managers to have support in making pro-environmental decisions. Crane (1997, p.132) refers to ‘green’ culture as a “cascade of
core values from top management downwards” and explains the ‘cultural fix’ prescription for improving environmental performance:

Primarily, the major objective is to develop a ‘strong’ culture – one that permeates and binds corporate members and fosters a sense of identity and commitment to common environmental goals and aspirations within the organisation.

This provides support for Davis-Blake and Pfeffer’s (1989, p.385) argument that “organizations are strong situations that have a large impact on individual attitudes and behavior”.

Thus individual dispositions will generally have only limited effects on decision-making, especially if the prevailing attitudes within the organisation foster pro-environmental thinking.

It is argued that capital investment decision-making varies with the individual manager’s perceptions of the prevailing attitudes and views within the organisation (that is, with psychological climate). It is posited that pro-environmental attitudes from the top and their influence on individual decision-makers, can also be fostered by carefully chosen social controls. The management disposition variable will not be included in the empirical work of this thesis because of the conceptual and measurement difficulties noted above. However, this study of the individual managers disposition is included as a contribution to the picture of the decision-maker provided in section 2.7 and for completeness of the model.

2.6.3.3 Background Data Measures

Individual manager characteristics, such as age and experience, are expected to produce some variance in capital investment decision-making by individual managers.
These characteristics are referred to as background data (or biodata) measures. Mumford and Stokes (1992, p.64) provide justification for the use of background data to explain and predict individual manager variances in behaviour:

People’s past behavior and experiences condition their future behavior and experiences. This is not to say that people necessarily behave in the future precisely as they have in the past, or that background data items are sensitive solely to issues of nurture. Instead this statement implies that prior learning and heredity, along with environmental circumstances in which they express themselves, make some forms of behavior more likely than others in new situations. As a result assessment of earlier behaviors and experiences permits some accuracy in predicting future behaviors and experiences, given a knowledge of environmental demands.

They also note (p.62) that “...scales derived from this descriptive information are among our best available predictors of criteria ranging from theft to leadership performance” and that “... this relatively straightforward assessment technique often yields better prediction than far more elaborate assessment procedures”.

No assessment of background data characteristics is carried out in this study. However, some information on these characteristics will be collected in the survey, in order to develop a profile of the managers. This will be used to ensure that the managers are suitably qualified as respondents (in terms of years decision-making experience and qualifications).

2.6.4 Assessment

The review of the literature on firm size overwhelmingly indicates that large firms are more environmentally conscious and have better environmental performance than SMEs. Evidence suggests that small firms receive less attention from regulators and the public than large firms and because of their smallness may at times “fall through the regulatory net”. However, there is little attention given in the literature to evaluation of regulatory mechanisms affecting small firms, or to consideration of alternatives which might be more
effective. Whilst environmental capital investment decisions have been investigated by a number of studies (White, Savage, Brody, Cavander and Lach, 1995; Shields, Beloff and Heller, 1997; Graf, Reiskin, White and Bidwell 1998; Boyd, 1998), these studies did not examine capital investment decision-making from the perspective of SMEs. Since the combined impact of many SMEs has been noted to be significant and evidence suggests that SMEs are less environmentally conscious than large firms, there is a need for research in this area.

Some research (Baylis et al, 1998b) casts doubt on studies of firm size and environmental performance, suggesting that the important variable may not be size. The reason for this doubt stems from concerns that a clear distinction has not been made between the effects of size and other variables. Additionally, reasons for the difference between the responses of large and small firms to environmental issues and associated regulation are as yet poorly understood.

There are clear indications that industry sensitivity is an important factor in moderating the response of firms to environmental issues. Concerns have been raised about the relationship between firm size and industry sensitivity and whether clear distinctions have been made between the two variables. In Parker’s (1998) study it was pointed out that one or two firms with poor environmental performance can give a whole industry a bad reputation. If SMEs are poor environmental performers it might be speculated that SMEs may be responsible for the poor reputations of some industries. This problem remains unexplored in the literature.

Environmental decision-making has a strong ethical component. The ethical culture and climate of the organisation strongly influences the ethical position taken by individual managers (Ford and Richardson, 1994). However, society must accept some responsibility
as it “sets up the ethical framework” within which companies must operate (Cadbury, 1987). The importance of the influence of top management is stressed by Crane (1997) in his description of a “cascade of core values from top management downwards”. This message is reinforced by Vecchio et al.’s (1996) view of “common aspirations and attitudes prevailing within an organisation”. March (1994) cautions that decision makers’ lack of experience of catastrophic consequences may lead to ‘exaggerated confidence’.

Some doubt has been raised about the value of biodata characteristics in predicting manager behaviour. Additionally, the overview of managers’ likely attitudes to environment provided by the literature suggests managers’ attitudes are strongly influenced by the organisational climate stemming from attitudes of top management. Individual manager’s disposition towards environment is held to affect the influence of the social controls on the capital investment decision. However, given the strong influence of organisational values indicated in the literature, it is likely that the influence of individual manager characteristics on capital investment decision-making will be limited, and thus it is expected that only a relatively small proportion of variance in capital investment decision-making will be accounted for by these factors.

2.7 The Decision-Maker

The picture of the decision-maker built from the literature began with the discussion of individual manager disposition in section 2.6.3. In this earlier discussion organisational pressures on the decision maker were examined. This study measures the influence of the social controls as perceived by individual capital investment managers. However, the decision is frequently a collective one, constrained by policy and procedures. Except in the smallest firms the decision process is likely to span across two or more organisational
levels with input from numerous staff members. This section completes the picture of the
decision-maker by further examining the organisational context and likely constraints on
the individual decision maker.

Butler, Davies, Pike and Sharp (1993, p.5) describe capital investment decision-making as:

...an incremental activity, involving many people throughout the organisational
hierarchy, over an extended period of time. While senior management may retain
final approval, actual decisions are effectively taken much earlier at a lower level, by a
process that is still not entirely clear.

This is consistent with the view of capital budgeting for environmental projects presented
by Klammer (1994, p.31), White et al (1995), and Shields et al (1997). All these authors
found capital budgeting for most firms is a multi-step process, with the problem most
often identified or the project conceived at plant level. White et al (1995) note that:

This tiered-type structure is typical of medium- to large-size firms. Initial project
identification and justification begins at the plant level, moves up to divisional or
group review (unless a project is small enough to qualify for discretionary spending at
the facility level), and finally is approved or rejected by corporate management.

White et al also note that product/operations, environmental, and finance/accounting staff
were most often cited as routine contributors to costing environmental projects.
Engineering staff were also frequently involved in this process.

White et al (1995) found that discretionary spending for capital projects was often
associated with firms having multiple plants (72% reported some level of discretionary
spending allowed in their firms). Smaller firms (with annual sales under $10 million)
commonly reported no allowance for discretionary spending. Even if they have strong
concerns about the environmental impacts of their operations, managers often have limited
power to make capital investment decisions in a pro-environmental manner. The comment
below from the manager of refining at one Canadian oil company illustrates the problem
that many managers may have:
I care as much as any other person about environmental degradation. I do have ideas about how I can reduce some of the environmental impacts of this operation. However, these involve investments for which I cannot guarantee results. If these investments affect output and profits, I am out of a job. Unless I have some discretionary funds to play around with, I can’t do anything on my own. The instructions from the top are clear, invest only as much as is necessary to get a clean chit from regulators (Sharma, Pablo & Vredenberg, 1999, p.88).

The following examples suggest that pro-environmental decision-making may be constrained or that pressure may be put on the decision maker especially by policies or attitudes of top management. Fineman (1996) indicates that “(h)igh profile leadership, or ‘messages from the top’ are crucial to both triggering and engendering pro-environmental interests” and that:

Where top leadership conveys indifference or hostility to greening, there is no appropriate pattern of feelings to seed pro-environmental sympathies. The lieutenants cannot wave the green flag alone – at least not without inviting suspicion or scorn.

Decisions are frequently constrained by the policy of top management. Thus attitudes of top management and organisational climate (Zannibi and Pike, 1992) are crucial to triggering pro-environmental spending (Fineman, 1996).

2.8 Capital Investment Decision-Making

The following section reviews the literature which investigates current capital investment practices. These include first who makes the decision and second lements of the capital investment decision: (i) environmental costing; (ii) the financial and non-financial factors; and (iii) Australian research on capital investment. Finally an assessment is made of the significance of this literature to the thesis.
2.8.1 Attributes of the Decision

Although capital expenditures are made for a variety of reasons, the evaluation techniques are the same (Gitman, Juchau, Flanagan, Pearson and Clemens, 2000). ‘Sophisticated’ techniques such as net present value (NPV) set out the principle factors considered in the financial analysis of a capital investment proposal. NPV explicitly considers the time value of money according to Gitman et al (2000, p.306). They note that NPV is “found by subtracting a project’s initial investment \( I \) from the present value of the cash inflows \( CF_t \) discounted at a rate equal to the firm’s cost of capital \( k \).” This is illustrated in the following equation:

\[
NPV = \text{present value of cash inflows} - \text{initial investment}
\]

\[
NPV = \sum_{t=1}^{n} \frac{CF_t}{(1+k)^t} - I
\]

Drawing on the relationships set out in this equation the main financial factors of the capital investment decision include the firm’s overall cost of capital, initial cost, and net annual cash flows (including terminal cash flow). Thus a decision-maker influenced by the environmental social controls may factor into the decision the following considerations:

- purchase of pollution prevention equipment as part of the initial investment;
- annual cash flows made higher/lower by insurance and interest charges reflecting poor/good environmental performance;
- overall operating cost increased by higher costs due to failure to eliminate waste from production processes; and
- terminal value (heavily influenced by clean-up cost if the initial investment economised on pollution prevention measures).
The risk of the project must also be evaluated. As Gitman et al point out (p.367) that for conventional capital investments risk:

...stems almost entirely from cash inflows, since the initial investment is generally known with relative certainty. These inflows, of course, derive from a number of risky variables related to revenues, expenditures and taxes. Examples of these would include the level of sales, cost of raw materials, labour rates, utility costs and tax rates...this risk actually results from the interaction of these underlying variables.

Additional variables which could be incorporated into capital budgeting decision-making “include costs, savings and any enhanced revenues likely to flow from environmental management systems incorporated in a project” (Parker, 2000, p.88). Consideration of non-financial factors such as strategic goals should precede financial analysis according to Carr and Tomkins (1996, p.200) since “no finance director would want to accept cash flow projections not predicated on sound business logic”.

The same conventional capital investment decision, influenced by one or more of the social controls might also balance factors such as lower initial investment on pollution prevention equipment against the risk of prosecution or legislation resulting from a spillage. As an example, a more costly tailings dam may have saved Esmeralda Exploration from serious loss resulting from spillage of cyanide into rivers in Romania and Hungary (Sydney Morning Herald, 11/7/2000). It is apparent that environmental risk, leading to reputational damage, fines and clean-up was never factored into the financial considerations for the project. The extent to which firms in Australia factor such risk into their decisions is untested in the literature but it may be concluded from this discussion that the social controls may influence firms to consider environmental risks such as risk of prosecution and litigation in the capital investment decision.
The remainder of this section is divided into three parts. First the contribution of the environmental costing literature is reviewed. This is followed by an overview of non-financial factors thought to influence the decision. The last part provides an overview of research on Australian capital budgeting practices as compared to practices in other Western countries.

2.8.2 Financial Factors and the Use of Environmental Costing

ANZECC (1998, p. 43) illustrates the importance of awareness of environmental costs to capital investment decision-making:

A major barrier to the adoption of cleaner production is that firms often do not know the environmental costs of operating their business and therefore do not know the financial benefits that can arise by reducing their environmental impacts.

Thus social controls may lose effectiveness as incentives to less polluting capital investment if their use is not coupled with measures to promote the use of environmental costing in firms. An important step in the promotion of environmental costing is the development of our understanding of the environmental costs currently measured by firms, and the influence of these costs on capital investment. Yet the accounting systems of many firms identify only the most obvious environmental costs (Boyd, 1998).

The importance of the relationship between environmental costs and capital investment is evidenced by the interest of the United States Environmental Protection Agency (EPA) and its funding of a number of studies of capital investment (White, Savage, Brody, Cavander and Lach, 1995; Shields, Beloff and Heller, 1997; Graf, Reiskin, White and Bidwell 1998; Boyd, 1998). White and Savage (1995), and Epstein and Roy (1998, p.103) suggest there is still much room for improvement in environmental cost accounting and
capital budgeting procedures in the USA. It appears to also be the case in Australia as Parker (2000, p.45) comments that:

…it is evident that a considerable range of environmental management strategies are being declared and pursued by some corporations. The scale of environmental management strategies and associated costs is apparently significant, and in at least some companies the strategies are being "normalised" into managers thinking and decision-making along with the usual operational, logistical, asset and human resource management functions for which they are responsible. However, it also appears that for many, the identification of and accounting for environmental costs has not yet begun or is only in its infancy.

An important first step towards improving environmental costing is defining the term 'environmental costs'. There is no standardised list of ‘environmental’ costs as "environmental costs are simply those incurred in meeting the environmental objectives of the firm, and such objectives vary across firms" (White et al, 1995, p.102). However, various categories of environmental costs have been suggested, which provide insight into costs which might be considered ‘environmental’. Gray, Bebbington and Walters (1993) suggest a functional cost categorisation, which includes fines and penalties, compliance costs, waste management costs, energy costs, remediation costs, and capital costs.

Gray et al see capital costs as a separate category. However, it is important to be aware of the potential for all environmental costs to influence capital investment managers to invest in cleaner, less polluting plant and equipment. In current costing systems many environmental costs may be hidden and thus overlooked by capital investment managers in their project assessments. An example of costs which may be overlooked is provided by Schmidheiny and Zorraquin (1998). They suggest that poor environmental performance is penalised by insurance companies, banks and other creditors, as well as analysts and investors, through reduced access and higher costs for insurance and funding. It is likely that many capital investment managers overlook these costs.
The USA EPA (1995) extends its categorisation of environmental costs beyond the more obvious compliance and contingent costs, to include costs of reputational damage arising from poor environmental performance. Compliance and production costs fall mainly within their ‘potentially hidden costs’ category. However, they also include two further categories ‘contingent costs’ such as penalties and fines, future compliance costs, remediation, property damage and legal expenses and also ‘image and relationship costs’ including relationship costs with customers, investors, staff and other stakeholders. Image and relationship costs are “...‘less tangible’ or ‘intangible’ because they are incurred to affect subjective (though measurable) perceptions of management, customers, employees, communities and regulators” (USA EPA, 1995, p.68). However image and relationship costs and contingent costs may also be ‘potentially hidden costs’.

White et al (1995, p.24) provide a list of responses from firms indicating which environmental costs are considered most frequently in capital budgeting. However, their study is limited to investigating whether the costs are considered or not. The extent to which these costs are considered by capital investment managers in their decision-making is not yet established in the literature. The findings of White et al’s study are summarised in Table 2.2.

White et al suggest that current practices encompass consideration of more conventional environmental costs only, in the capital budgeting of many companies. Their comments about these results include the following points:

- The highest percent responses are the front-line waste management costs, which motivate environmental project proposals in the first place.
- An unexpected finding is the appearance of future regulatory compliance costs in the upper half of the table. They comment that “this modest showing suggests that a
significant number of firms increasingly are looking for ways to avoid future compliance costs in addition to controlling or eliminating current regulatory pressures. Such behavior — reflecting a desire to get off the "regulatory treadmill" — may portend a future of greater visibility for prevention-oriented projects in the capital budgeting process.”

**Table 2.2.**

*Costs normally considered in financial analysis*

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>% who consider</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-site air/wastewater/hazardous waste testing/monitoring</td>
<td>79</td>
</tr>
<tr>
<td>Energy costs</td>
<td>78</td>
</tr>
<tr>
<td>On-site wastewater pre-treatment/treatment/disposal</td>
<td>77</td>
</tr>
<tr>
<td>Licensing/permitting</td>
<td>76</td>
</tr>
<tr>
<td>Water costs</td>
<td>74</td>
</tr>
<tr>
<td>Production efficiency/yield</td>
<td>74</td>
</tr>
<tr>
<td>On-site hazardous waste pre-treatment/treatment/disposal</td>
<td>7†</td>
</tr>
<tr>
<td>On-site hazardous waste handling (storage, labelling)</td>
<td>70</td>
</tr>
<tr>
<td>On-site air emission controls</td>
<td>69</td>
</tr>
<tr>
<td>Employee safety/health compensation claims</td>
<td>69</td>
</tr>
<tr>
<td>Off-site hazardous waste transport</td>
<td>62</td>
</tr>
<tr>
<td>Manifesting for off-site hazardous waste transport</td>
<td>59</td>
</tr>
<tr>
<td>Staff training for environmental compliance</td>
<td>59</td>
</tr>
<tr>
<td>Future regulatory compliance costs</td>
<td>59</td>
</tr>
<tr>
<td>Environmental penalties/fines</td>
<td>57</td>
</tr>
<tr>
<td>Insurance costs</td>
<td>55</td>
</tr>
<tr>
<td>Corporate image effects</td>
<td>55</td>
</tr>
<tr>
<td>Personal injury claims</td>
<td>54</td>
</tr>
<tr>
<td>Reporting to government agencies</td>
<td>53</td>
</tr>
<tr>
<td>Frequency of plant shutdown</td>
<td>51</td>
</tr>
<tr>
<td>Off-site wastewater/hazardous waste pre-treatment/treatment</td>
<td>50</td>
</tr>
<tr>
<td>Property damage</td>
<td>50</td>
</tr>
<tr>
<td>Environmental staff labour time</td>
<td>41</td>
</tr>
<tr>
<td>Air pollutant emission credits (SOx, NOx)</td>
<td>40</td>
</tr>
<tr>
<td>Marketable by-products</td>
<td>36</td>
</tr>
<tr>
<td>Natural resource damage</td>
<td>31</td>
</tr>
<tr>
<td>Legal staff labour time</td>
<td>28</td>
</tr>
<tr>
<td>Sales of environmentally friendly/green products</td>
<td>25</td>
</tr>
</tbody>
</table>

The lower half of the response list (57% or less) includes contingent or less tangible costs such as environmental fines and penalties, corporate image, insurance costs, natural resources damage costs which are of a contingent or probabilistic nature. This might be explained in terms of bounded rationality and decision satisficing. Managers with imperfect information may settle for the (apparently satisfactory) decision and may not consider all alternative choices or possible consequences of their choice. Another possible explanation is offered by March (1994). March suggests that because most decision-makers have no memory of catastrophic consequences, they tend to have “exaggerated confidence” in their decisions. Exaggerated confidence can lead to catastrophic consequences (in a financial as well as an environmental sense). Yet the research of White et al (1995) above, indicates that many firms still treat the possibility of low probability, high cost incidents as a low priority in their decision-making.

In Australia, the importance of various environmental costs in capital investment decisions is largely unknown. However, for many companies environmental cost is seen to be rapidly increasing in significance (Parker, 1998). Parker (p.65) suggests that the incorporation of these additional variables into capital investment decisions will aid in identifying “otherwise hidden potential environmental impacts upon the financial condition and performance of the organisation.” Additionally, ‘green’ capital investments will be placed on a more equal footing compared with more conventional capital expenditures. Parker also points out (p.65) that “incorporation of environmental costs into the incremental operating budget system, will be an important precursor to the introduction of environmental costs into the capital expenditure budget.”

However, the importance of capital investment noted by Butler et al (1993) (discussed in section 1.1) suggests that it is not sufficient to await the natural evolutionary processes of
costing development. Rather, an increased understanding of those cost factors which currently most influence capital investment, may enable the development of regulatory and related measures, which facilitate this process.

The above discussion strongly suggests that: 1) environmental costing is a key mechanism which encourages firms to make environmentally responsible capital investments and 2) that much uncertainty remains as to the actual impact of these costs on the decisions made by capital investment managers.

Although Parker (1998) touches on the application of environmental costs in capital budgeting, no Australian studies have been discovered which systematically examine the effect of environmental costs on capital investment decision-making. As well Parker's research was limited to case studies and so a relatively small number of firms were investigated.

2.8.3 Non-financial factors

Research evidence suggests that managers not only recognise non-financial benefits but consider them more important than financial benefits. Abdel-kader and Dugdale's (1998) survey noted at least eight non-financial criteria which managers considered important to the capital investment decision. The quality and reliability of outputs are considered important by 87% of respondents. "Requirements of customers" was found to be important to all firms surveyed.

Butler et al (1993, p.70) found from survey and experiment rankings, that the following attributes were more important to the capital budgeting decision than IRR or payback
period – degree of corporate fit, effect on product quality, level of agreement/opposition, effect on productivity, growth of related market, contribution to corporate image. Epstein and Roy (1998, p.106) point out that “current accounting and capital investment methods do not provide the proper framework to analyse the environmental impacts”.

The evolution of the investment management process is discussed by Klammer (1994, p.18) who notes that “qualitative measures could become non-financial quantitative measures. They may also become a more important part of the decision process.” This is consistent with the view of Boyd (1998, p.46) who suggests that:

...non-quantified environmental benefits do not necessarily imply an inadequate weighting of environmental benefits in the decision-making process. Instead lack of quantification may simply indicate the inherent difficulty of establishing precise financial values.

2.8.4 Australian Capital Investment Practices

A study by Kester, Chang, Echanis et al (1999, p.26) of capital investment practices in the Asia-Pacific region indicates the dominant methods of evaluating and ranking proposed capital investments. A summary of the Australian findings of the study indicates that:

- The methods of most fundamental importance were the discounted cash flow (DCF) techniques (net present value [NPV] and internal rate of return [IRR]). The managers’ rating of perceived importance of both NPV and IRR was 96%.
- Payback period was of lesser importance and mainly used for short term investments.
- Most managers evaluate after-tax cash flows.
- A single discount rate based on the company’s weighted average cost of capital was used by 48% of companies, while 37.5% of companies used multiple risk adjusted discount rates.
• Australian capital budgeting evaluation practices are consistent with those of other Western countries.

The findings of Kester et al’s study are significant to this thesis because:

1. Evaluation of after-tax cash flows gives an indication that depreciation allowances is a relevant factor for capital investment proposals.

2. The more common use of discounted cash flow techniques is more suited to evaluation of environmental factors which typically require a long period to show returns.

3. The consistency of Australian capital budgeting practices with those of other developed nations allows some ‘cross pollination’ in terms of research findings; that is, this study’s findings can be held to have some relevance for researchers from other developed nations (and vice versa).

These findings are consistent with those of Freeman and Hobbes (1991) who found an increase in use of DCF techniques over the period 1979 to 1989. Freeman and Hobbes also found that 74% of respondents indicated that capital projects which did not meet defined company benchmarks had been accepted. Reasons for this were given by respondents as strategic, mandatory (e.g. pollution control equipment), “fudged” estimates or other non-financial reasons.

A method of accounting for “the risks of investment and inherent imperfection of information” is the use of hurdle rates and capital rationing (Boyd, 1998). Boyd comments (p.48) that:
In general firms will not make investments that fall short of the hurdle rate, even if the investments have a positive rate of return. This can be a source of frustration to advocates of pollution prevention, who see a positive rate of return as evidence of profitability.

Freeman and Hobbes (1991, p.38) discuss the selection of the discount rate to be used for project evaluation. They note that:

...the company cost of capital is the correct discount rate for projects that have the same risk as the company’s existing business but not for those that are safer or riskier than the companies average. The problem is to judge the relative risks of the projects available to the firm.

They point out that cost of borrowing is less than the company’s cost of capital, which reflects the cost of both borrowed and equity funds. The use of cost of borrowing as a hurdle rate for project selection may result in the acceptance of potentially unprofitable projects. However, Freeman and Hobbes (1991, p.40) note that “some 39% of firms appear to use cost of borrowing as a suitable bench mark hurdle rate”.

Boyd (1998, p.49) notes that the IRR must be compared to cost of capital (opportunity cost of not using the capital for a risk equivalent project). He points out the uncertainties associated with estimates of rates of return, which may fail to incorporate harder to quantify costs and benefits.

2.8.5 Assessment

Studies of capital investment decision-making (such as that of Butler et al, 1993) and those more specifically of environmental capital investment decision-making (such as White et al, 1995, and Shields et al, 1998) provide similar pictures of investment decisions of medium to large firms. There is generally a tiered structure for capital investment decision-making, with the final decision, particularly for large projects, generally taken at the senior
management level. Environmental projects, unless mandatory, commonly compete in the same pool and face the same hurdle rates as other projects.

Non-financial factors have been found to be more important than financial factors. However, non-financial factors are ultimately financial factors which are difficult to quantify. Evidence suggests that various risks of the project, including those related to the non-financial factors are either incorporated into the financial decision or considered separately, most commonly through sensitivity analysis. Firms are now being made more aware of the importance of environmental issues in risk evaluation, because of the increased interest of banks and insurers. Poor environmental performance may affect availability and cost of both borrowing and insurance. Many questions can be raised about the influences on capital investment decision-making. These include why many firms avoid quantification of liability and whether the commonly stated reason (difficulty in estimating the magnitude of costs) is the actual reason. It is possible that in the highly litigated environment of the USA, firms are reluctant to divulge their concerns about liability, even in an anonymous survey.

Whether Australian firms have the same concerns about environmental liability remains untested. Similarly, many of the benefits of pollution prevention investment suggested by the EPA (USA) (1995) which could be expected to influence capital investment decision-making, also remain untested in the Australian context.

As yet unknown is the extent to which the perceptions of firms about factors such as customer, employee and investor attitudes on environmental performance and ease of access to credit, influence capital investment decisions. Schmidheiny and Zorraquin (1998, p.68) suggest that “the market can be a much harsher master than governments” and
thus corporate directors may favour government regulations over market instruments. The perceptions of firms about the relative influence of environmental regulation and the introduction of economic instruments is as yet untested.

2.9 Human Information Processing Aspects of Capital Investment Decision-Making

Human information processing in the context of decision-making is described by Al-Kahfaji, Aly, Gheyara and Metawae, (1993, p.44):

Conditions of uncertainty require decision makers to use their interpretive skills in their search for information. One reason for the use of such skills is that information may be cast in the form of signals or cues which could be singly or batch fed to a decision maker. In this case, one would expect such cues to concurrently contain information which could be redundant or overlapping with alternate cues. In the absence of a direct exposure to the occurrence of a given event (certainty), cues would help a decision maker to estimate the most likely (probabilistic) outcomes about the desired environment, ie. to formulate judgements.

Relying on this description, capital investment decision-making is seen as the formulation of a judgement based upon multiple cues. These cues may be assessed independently (main effects) or in combination with other effects (configurally). The decision is held to be economically rational, although limitations to purely rational decision-making are recognised and discussed in the following section. This is followed by a discussion of literature relevant to main effects and configurality; self-insight into cue utilisation and decision confidence.
2.9.1 Rational Decision-Making and Bounded Rationality

Environment is often a component of business decisions, in which many other factors must be considered. Although case studies (for example, Everett, Mack & Oresick, 1993) may focus on decisions where environment was a major and emotional issue, many of the day to day decisions of the firm, in which environment is one factor, must logically, be made on a more rational basis. To this extent, the rational decision process is considered relevant to this study.

Rational theories of choice are described by March (1994, p.2), as preference-based and pursuing a "logic of consequence." Thus, the decision depends on expectations of "future effects of current actions" and an evaluation of these future effects in terms of the personal preference of the decision maker (and/or company policy). The choice depends on available alternatives, expectations of consequences, preferences, and the decision rule (how the choice is made among alternatives according to assigned value of the consequences) (March, 1994). Beach et al (1992, p.180) note that before deliberations take place, the decision is ‘framed’ or put into a context, which classifies the decision according to the type of situation, issues, goals and plans, of importance to the decision-maker or organisation.

Finance theories such as portfolio theory, rely on the assumption that investors are “utility maximisers who make investment decisions only in terms of expected return and standard deviation (variance) of returns” (Bishop, Crapp, Faff and Twite, 1993, p.136). However, March (1994, p.4) comments of such “pure versions of rational choice” that they:
...have well-established positions in the prediction of aggregate behavior, where they are sometimes able to capture a rational "signal" within the subjective "noise" of individual choice. They are sources of predictions of considerable generality, for example the prediction that an increase in price will lead (usually) to an aggregate decrease in demand (although some individuals may be willing to buy more at a higher price than a lower one). In spite of their utility for these qualitative aggregate predictions, pure versions of rational choice are hard to accept as credible portraits of actual individuals or organizational actors.

Rational theory also assumes that all alternatives will be considered; the consequences of each alternative will be considered and that accurate information is available at no cost (Vecchio, Hearn and Southey, 1996). According to Kahneman and Tversky (1999) information for complex decision-making may be assessed by using 'rules of thumb' or "heuristic principles" which reduce the complex tasks of assessing probabilities and predicting values to simpler judgemental operations." The views of Everett et al (1993) and March (1978) and Kahneman and Tversky (1999) point to the inadequacies of rational theory, and the strong emotional and ethical component of the decision process has been illustrated in the work of Fineman (1996, 1997); Everett Mack and Oresick (1993); and Rutledge and Karim (1999).

In the light of these works, environmental decision-making cannot be viewed as a wholly objective and rational process. March (1994, p.5) comments that:

Pure rationality strains credulity as a description of how decisions actually happen. As a result there have been numerous efforts to modify theories of rational choice, keeping the basic structure but revising the key assumptions to reflect observed behavior more accurately.

Everett et al (1993, p.64) comment that "[i]n facing environmental questions, the human beings who run corporations are just as complex and at times contradictory as any others". They suggest that "these are tough times for believers in completely rational decision

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24 One example given by Kahneman and Tversky (p.4) is the representativeness heuristic. As an instance of the use of this heuristic they suggest that the probability of a person being a librarian might be assessed by the degree to which the person is similar to the stereotype of a librarian.
making.” This view is also supported by March’s (1978) comments on the inconsistencies of decision makers:

> Choices are often made without respect to tastes. Human decision makers routinely ignore their own, fully conscious, preferences, in making decisions. They follow rules, traditions, hunches, and the advice or actions of others.

As noted by Thorgersen (1994) (see section 3.3.5) the way in which the decision is framed and whether the decision is seen as economic or moral may influence the eventual choice.

March (1994, p.6) comments that post-decision surprise and post-decision regret are characteristics of many decisions. That this is especially true of environmental decisions is illustrated by Rubenstein (1989, p.31):

> “But Exxon’s accountants must have known that every shipment of North Shore crude carried with it an associated risk and potential liability. In 1989, the risk became reality and the potential liability a real cost – a net cost of $850 million.”

It appears that the decision process followed by Exxon managers assessing the risks of oil shipments, suffered from at least some of the deficiencies described by March in his discussion of bounded rationality.

Bounded rationality is a form of rational choice theory, in which it is recognised that not all alternatives and consequences are known or considered. March (p.9) suggests that:

> Instead of considering all the alternatives, decision makers typically appear to consider only a few and look at them sequentially rather than simultaneously. Decision makers do not consider all the consequences of their alternatives. They focus on some and ignore others. Relevant information about the consequences is not sought, and available information is often not used... The decision rules used by real decision makers seem to differ from the ones imagined by decision theory.

Vecchio et al (1996) suggest that bounded rationality results in managers “satisficing” (settling for solutions that are less than ideal) rather than “maximising”.
2.9.2 Main Effects and Configurality

Judgments are frequently represented in the literature as linear models. Brown and Solomon (1991, p.100) discussing audit judgements note that “…it may appear that auditors evaluate control systems by independently processing individual controls as opposed to the pattern (or configuration) of control features.” However, Maines (1995, p.77) notes that:

...decision makers often believe that their decision processes involve complex information evaluation and integration strategies. For example, they may explicitly state that their evaluation of one piece of information depends on the specific value of another piece of information, which suggests configural or interactive information processing.

Brown and Solomon (1990, 1991) found evidence of auditors’ use of configural information processing. Brown and Solomon (1990) define configural information processing as “cognition in which the pattern (or configuration) of stimuli is important to the subsequent judgment/decision”.

Auditors were also found to use configural cue processing by Hooper and Trotman (1994). They extended the research of Brown and Solomon (1991) and found the percentage of auditors who process cues configurally to be less than that found by Brown and Solomon.25

2.9.3 Self Insight and Decision Confidence

Solomon and Shields (1995, p.151) note that self insight has “typically been assessed as the correlation, over all cues, between a subject’s cue usage and the importance rating

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25 Brown and Solomon found 51% of auditors used configural processing. Using the same materials as the Brown and Solomon experiment, for two treatment groups, Hooper and Trotman found levels of 22% and 37%.
subjectively attached to each cue (eg. by allocating 100 points among the cues)

Earlier studies such as those of Slovic, Fleissner & Bauman, (1972); and Ashton,(1974 )suggest that decision-makers frequently under or overestimate the perceived importance of cues and consequently may underestimate the reliance they place on a small number of cues. However, Gibbins and Swieringa (1995) note that auditors have been found to have a higher degree of self insight than student participants of many general studies. This is attributed (p.245) to a “professional environment in which one is expected to know how one’s choices were made” and to “significant task relevant experience and expertise”. These same factors may reasonably be expected to apply to capital investment managers.

Configural cue processing and self-insight are seen as related to decision confidence and accuracy by Hooper and Trotman (1991, p.15). The findings of their experiment indicated that:

...the level of consensus was higher for auditors who processed configurally than for those who did not process configurally. If consensus is accepted as a reasonable surrogate for accuracy (R. Libby, 1981; R. Ashton , 1982; A. Ashton, 1985) then it can be suggested that increased configural processing is associated with improved performance.

Additionally, in one group of auditors, who were asked to provide explanations of their information processing, the configural processors saw relevant cues as being substitutable (this was not the case for the non-configural cue processors). Hooper and Trotman conclude that configural cue processing is desirable and reduces inconsistencies in decision making.

However, March (1994, p.13) cautions that decision confidence is not always desirable. He suggests that “decision makers recognize patterns in the situations they face and apply rules of appropriate behavior to those situations”. Memory is a strong component of this
process and most decision makers have no memory of catastrophic consequences of their decisions”. “Exaggerated confidence” may occur in “high reliability” organisations (March, p.48) which go to great lengths to avoid accidents. Most individual decision makers have no experience of a failure and think the system is more reliable than it is. An irony in this situation is pointed out by March (p.49):

The perversities involved in high reliability are – at some substantial cost – self-correcting. Degradation of reliability leads to increasing likelihood that individuals will experience a breakdown and recognize that they have underestimated the danger.

2.9.4 Assessment

In accord with the views of March (1994) and Vecchio (1996), the environmental investment decision is viewed as a rational ‘satisficing’ decision. This view is consistent with the literature on environmental cost accounting which highlights the deficiencies in the information systems of many environmental decision makers, due to inadequacies in environmental costing.

One of the research objectives, tested in the experiment, is to determine whether the investment managers use cues individually (main effects) or configurally (interactions). Cue configurality has been linked to self-insight in decision makers. The research indicates that decision makers who process cues configurally may have higher levels of decision confidence, consistency and accuracy. Thus, all of these factors are expected to lead to improved performance of decision makers. Although much of the research in this area has been carried out using auditors as subjects, the findings are posited to be applicable to capital investment managers, who similarly make the decisions frequently and are expected to be able to justify these decisions. However, March cautions that lack of experience of decision failure may lead to excessive confidence with disastrous consequences.
2.10 Relationship of the Study to the Extant Literature

A model has been proposed (Section 1.5) of the effect of environmental social controls on the capital investment decision-making of the firm. The literature review of the variables of the model and relationships between them suggests that our knowledge of the variables and relationships between them is limited. The review further suggests the need for investigation in the following areas:

(i) The influence of the social controls, namely, environmental disclosure requirements, regulation, subsidies and stakeholder pressure, on the capital investment decision-making of the firm. It is posited that there are significant differences in the nature and effect of the four independent variables as incentives for more pro-environmental capital investment decision-making by firms. The nature of interactions between the measures (sections 2.2 – 2.5) is as yet uninvestigated.

(ii) The effect of the moderating variables, firm size and industry sensitivity. The extent to which these variables affect the influence of the social controls on capital investment decision-making is as yet unknown. There is general agreement in the literature (section 2.6) that small firms are less environmentally aware.

(iii) The nature of dependent variable, capital investment decision-making (section 2.8). The extent to which the firm’s investments in new technology are environmentally responsible may depend on many variables including the influence of social controls, and also firm size, industry type and management disposition. The literature provides many case studies (for example, EPA South Australia, 2001) which demonstrate significant cost savings to be gained from investment in cleaner technology. However, there is a scarcity of literature on the influence of social controls in driving firms towards environmentally responsible capital investment.
Understanding of the environmental attributes of capital investment decision-making is in the early stages of development. More specifically little work has been done in Australia to examine the environmental attributes of the decision. Although environmental factors considered in the capital investment decision have been investigated, the influence of the social controls on various aspects of the decision is unknown. The need for further investigation of these three areas of the model is examined in more detail below.

2.10.1 The Independent Variables

The evidence set out in the extant literature suggests that actual environmental performance is not reflected in the environmental disclosures of firms in Australia. A growing body of evidence indicates that improved environmental performance is reflected in profitability, although there may be a 'lag' effect of one or two years. Cost of capital and damage to reputation are significant areas in which environmental performance has been shown to affect profitability.

The literature on relationships among environmental performance, disclosure and profitability is significant because it provides evidence of the importance of finance in environmental decision-making. If disclosure requirements impact on the finances of the firm they may be an effective means of motivating improved environmental performance. Whether there is a relationship between disclosure requirements in Australia and more pro-environmental capital investment decision-making remains untested.

Regulation is often implemented without evaluation and there is insufficient understanding of the cost to firms. Experiences of other countries with the introduction of economic instruments provides little indication of the financial impact on individual firms.
The introduction of economic instruments in Australia is as yet in the early stages. An evaluation of the impact of existing instruments and possible impacts of a wider variety of instruments and combinations of instruments is absent from the literature. However, the low level of charges for pollution emissions in comparison to international standards, leaves some doubt as to their likely effectiveness in influencing capital investment decision-making.

Subsidies are a little used economic instrument and are widely viewed as perverse because they may reward poor environmental performers. However, the literature indicates that in some situations when other measures are ineffective, subsidies may be useful. This is especially the case with small and new firms which may lack funding for pro-environmental capital investment. Although there is support in the literature for the propositions that firm size, industry, and managerial disposition moderate the effect of financial initiatives, the specific relationship of these variables to capital investment decision-making has not yet been established.

Stakeholder pressure has been frequently considered in relation to its effect on environmental disclosures. It has been put forward as an explanation for voluntary disclosure and a reason for increased use of mandatory disclosure. The literature indicates that stakeholder pressure does influence capital investment decision-making (see, for example, Ditz, Ranganathan and Banks, 1995). However, an examination of its relative influence compared to other social controls is absent from the literature.
Little work has been done to integrate the work on various aspects of the relationship between the social controls and the capital investment decision. This study draws together the related findings on each of the social controls and extends the literature by investigating the relative weights of the social controls in the capital investment decision.

2.10.2 The Moderating Variables

There is little attention given in the literature to evaluation of regulatory mechanisms affecting small firms, or to consideration of alternatives which might be more effective. The combined impact of many SMEs is significant and evidence suggests that SMEs often slip through the regulatory net. Reasons for the difference between the responses of large and small firms to environmental issues and associated regulation are as yet poorly understood. Similarly, industry differences in the capital investment response to the social controls have not yet been investigated. There are clear indications that industries which are closer to end user markets or receive more public attention because of highly polluting activities are more environmentally conscious. As yet, little has been done to investigate ways to make use of this response to promote more pro-environmental capital investment.

2.10.3 The Dependent Variable

The literature suggests that factors such as customer, employee and investor attitudes to environmental performance and ease of access to credit, influence capital investment decisions. However, although this influence has been noted in Australian literature, no work has been done to investigate whether these factors are considered in the capital investment decisions of Australian firms.
Schmidheiny and Zorraquin (1998, p.68) suggest that “the market can be a much harsher master than governments”. This appears to be the case in Australia, where pollution charges are relatively low and requirements for site clean-up are relatively less onerous than in many developed nations. However, the extent to which regulatory requirements and stakeholder pressure are considered in capital investments of Australian firms is unknown.

Influencing firms to make more pro-environmental capital investments requires greater understanding of the environmental factors considered for the decision. However, the level of influence of various environmental attributes of the capital investment decision remains untested. This study will extend our knowledge by measuring the relative weights of various environmental attributes of the capital investment decision.
Chapter 3

Research Methodology

3.1 Introduction and Chapter Overview

The positive approach to research methodology in this thesis is underpinned by the assumption that "we all live in the same independent and external social world" (Gill and Johnson, 1997, p.135). As Gill and Johnson (p.136) observe:

...the implicit acceptance of a realist position is necessary in all versions of experimental and survey methodologies. The operationalization of theoretical concepts and the assignment of explanatory or independent variables imply 'this is concrete social reality'.

Whilst this assumption is accepted, it is moderated by recognition of the deficiencies in human capacity for objective observation noted by Sayer (1994) (discussed in section 1.5). For the empirical work of the thesis, two research methods have been selected which are posited to be consistent with this philosophical position. These are experimentation and passive observation.

The literature in Chapter Two supports the investigation of the model introduced in Chapter One, by indicating, inter-alia, that the relative influence of the social controls on capital investment decision-making and possible interactions between them are as yet unexplored. Experimentation was chosen as the most suitable method for investigation of these influences and interactions. Passive observation is used to further investigate the relative influence of a range of environmental attributes of each social control measure
suggested by the literature. It is also used for the investigation of firm size and industry effects and to provide a broader description of capital investment decision-making.

The remainder of the chapter is set out as follows: In section 3.2 the detailed research hypotheses are developed from the research objectives stated in Chapter One and the discussion of the literature in Chapter Two. In section 3.3 the details of the research design are provided. Finally, section 3.4 sets out the research implementation strategy and study population.

3.2 Detailed Research Hypotheses and Questions

To facilitate the research objectives of this study, hypotheses and research questions suggested by the literature, have been developed and are set out in this section. These hypotheses and research questions are accompanied by discussion the relevant literature.

3.2.1 Relative Weights of the Environmental Social Control Measures

Logic suggests that an important contribution to improving the firm’s environmental performance would be investment in less polluting plant and equipment. The relative weight of influence of each of the social controls on capital investment decision-making remains untested. However, the literature provides some discussion of the likely importance of each social control measure. An overview of relevant literature follows:
3.2.1.1 Mandatory Disclosure

The discussion in section 2.5 focused on the costs and benefits of environmental disclosures by firms. The evidence (Schmidheiny and Zorraquin, 1998; Wright, 1998; Thompson, 1998a, 1998b; and Girardi, 1999) drawn from this discussion suggests that environmental disclosure is increasingly affecting factors such as cost of capital, ease of access to finance and market valuation of the firm. These factors are likely to have an influence on capital investment decision-making. The literature suggests a possible increase by the Australian banking and insurance sectors in incorporating environmental risk into their risk assessment processes. As an example, disclosures about the firm’s regulatory compliance in the directors report as required by Corporations Law s299(1)(f) could influence availability and cost of borrowing and insurance. However, the literature provides little empirical evidence as to the extent of these effects, such as whether they influence the capital investment decision-making of the firm. It is likely that if firms are penalised for poor environmental performance, by higher costs of borrowing and insurance or lower share prices, they may be mindful of this and invest in less polluting plant and equipment.

3.2.1.2 Regulatory Costs

Evidence regarding site clean-up (Bates, 2000) suggests that liability for clean-up of polluted sites, although less in Australia than in the USA, can be very costly. The literature suggests a number of costs arising from site pollution. These include impairment of the firm’s assets and possible shut down of facilities (CICA, 1993). Related costs include adverse publicity, increase in insurance premiums and disruption to business (Brennan, 1995).
Evidence regarding pollution charges comes from the work of Hamilton, Hundloe and Quiggin (1997, section 6.3) who suggest that existing systems of load-based licensing appear to provide “significant motivating factors in reducing pollution.” However, the work of NSW EPA (1998) indicates that for load-based licensing the “expected level of abatement (and therefore associated costs) are key unknowns and difficult to predict with any degree of confidence” (NSW EPA, 1998). The low level of charges relative to international standards, discussed in section 1.2.3, leads to the expectation that their influence on capital investment decision-making will be small.

3.2.1.3 Subsidisation

The scarcity of literature on the effect of tax concessions and direct subsidies suggests the need for a better understanding of their influence on firms. However, there is some evidence that subsidies to encourage environmental improvements are effective. Rae (1997) suggests that in situations where the desired behaviour is unlikely to occur without some financial incentive, subsidies may be appropriate. Evidence of the successful use of subsidies is provided by the EPA (South Australia) (2001) and Lockhart (1997) supports the view that direct subsidies may be effective in certain situations, particularly for small firms. However, their use is limited in Australia.

Depreciation allowances are the main form of indirect subsidisation for environmental expenditure. However, Dodds (1999) raises a question about the value of environmental tax concessions as “the incentive provided is unlikely to be set at the optimal rate.” Woellner et al (2001) and Deutsch et al (2001) also indicate that these tax concessions are small. Additionally, indications of the effectiveness of these tax concessions are derived in the main from economic projections, rather than empirical research. Lockhart (1997,
p.227) suggests that uncertainties exist and that investigation is needed to determine "whether tax preferences can be effective in changing behaviour to actions aimed at environmental protection".

3.2.1.4 Stakeholder Opinion

It may be inferred from the literature examined in section 2.4, that stakeholder influence on environmental performance generally (and consequently on capital investment decision-making) is increasing. Fineman and Clarke (1996) found customers, creditors and employees, had little influence on corporate ‘greening’. Australian studies Wright (1998) and Girardi (1999) suggest increasing awareness of environmental issues by banks, insurers and credit rating agencies. This is consistent with evidence from the UK (Thompson, 1998 a, b, and Schmidheiny and Zorraquin, 1998). There is abundant evidence of the influence of other stakeholders (see, Mitchell et al, 1997; Nasi et al, 1997). Studies of the firm’s response to its stakeholders leave uncertainties about the nature of the firm’s response to environmental pressures from stakeholder groups and the degree of influence on the firm’s decision-making.

Although the literature is indicative of the influence of the social controls on factors which are relevant to the capital investment, the effects of these measures have largely been considered for each measure in isolation from the others. As there is insufficient evidence to suggest a likely ranking order for the weights of the variables the following research question is proposed:
R1 What is the relative weight of:
  o Mandatory environmental disclosure;
  o Regulatory costs;
  o Subsidisation; and
  o Stakeholder opinion
in the capital investment manager's assessment of the acceptability of the capital investment proposal?

3.2.2 Environmental Cue Processing

The manner in which capital investment managers process cues is as yet undetermined. Do managers evaluate cues individually or use the cues configurally - that is, combine two or more cues to form a composite cue? As an example, they may evaluate the impact of pollution charges when offset by a depreciation allowance, thus forming a combined cue 'net pollution costs.' This is important to the research objectives because a finding of configural cue processing is an indication the social controls are having an influence not only as separate measures (main effects) but also in combination with one another (interactions). Such a finding may suggest the need to consider these combined effects; for example, a change in mandatory disclosure requirements may have an influence on managers' capital investment decision-making responses to stakeholder opinion.

Decision-making and auditing literature both indicate that experienced decision-makers who are accustomed to having to justify their decisions, may process cues configurally. Although, the capital investment decision-making literature has not as yet examined this aspect of decision-making; auditing literature (Hooper and Trotman, 1994; Trotman 1996) provides a detailed picture of cue processing. The complex decisions made by auditors evaluating multiple cues, parallel the evaluation process carried out by the capital
investment manager. This suggests that it is likely that many capital investment decision-makers also use configural cue processing.

Relying on this evidence the following hypothesis is proposed:

H 1 Capital investment managers process environmental cues configurally when assessing the acceptability of a capital investment proposal.

3.2.3 Relative Influence of Environmental Versus Mainstream Financial and Strategic Factors

The research question regarding the influence of environmental factors in the capital investment decision as compared to mainstream financial and strategic factors as yet remains untested in the literature. Work by Butler et al (1993) indicates that non-financial and strategic attributes of the capital investment decision were weighted more heavily than financial factors such as IRR or payback period. Butler et al’s finding that six non-financial (strategic) criteria were ranked higher in importance to the investment decision than the financial factors, suggests the possibility that environmental factors (which may also be regarded as strategic factors) may similarly be ranked highly as an influence on the capital investment decision.

However, their work stopped short of investigating environmental factors. A wide range of environmental factors are included for testing in the passive observation survey. These include the influence of the main mandatory disclosure requirements, various pollution controls, direct environmental subsidies and depreciation allowances and various groups of stakeholders. The influence of the financial and strategic factors discussed by Butler et al will be compared to these environmental factors. As there is no direct evidence
of the influence of environmental factors as compared to mainstream financial and strategic factors in capital investment decisions, the following research question is posed:

RQ2 How does the influence of the environmental factors compare with that of mainstream financial and strategic factors in the capital investment decision?

3.2.4 The Moderating Variables

This section presents two hypotheses related to the influence of the moderating variables\textsuperscript{26} in constraining the firm's capital investment decisions. Section 3.2.4.1 presents the hypothesis on firm size and in section 3.2.4.2 the hypothesis on industry sensitivity is presented.

3.2.4.1 Firm Size

Evidence from the literature has consistently indicated that large firms are better environmental performers and make more environmental disclosures than smaller firms (see Freedman and Jaggi, 1998; Zhuang and Synodinos, 1997; Hossain, Tan and Adams, 1994, Patten, 1992). Greater public pressure and more resources are given as reasons for this finding. Studies of small to medium entities (SMEs) have found them to be low in awareness of environmental legislation and of the impact of their operations (Baylis, Connell and Flynn, 1998a; Rowe and Hollingsworth, 1996).

\textsuperscript{26} As noted in section 1.9.2.2, the third moderating variable – management disposition – was excluded from the empirical work of the thesis. First, its effects are posited to be small. Second, management disposition is an elusive concept and it is held that it could not be tested effectively within the constraints of this thesis.
SMEs tend to 'fall through the regulatory net.' They often receive less attention from both the public and the EPA and are subjected to less rigorous requirements for environmental disclosure. However, the combined environmental impact of many SMEs can be substantial. Research into the environmental performance of SMEs is further complicated by concerns of researchers, such as:

(i) Difficulties in making comparisons between empirical results using disparate measurement bases for firm size.

(ii) Difficulties in isolating the effects of variables; concerns that size is not the most important variable, but is merely a proxy for other variables (Bujaki and Richardson, 1997).

In spite of the above, evidence from the literature, using various methods and measures of size, consistently shows a lower standard of environmental performance for SMEs. Although there is a deficit of research on the relationship between firm size and environmental capital investment, the small business literature on environmental performance suggests that smaller firms will be generally less able to afford environmental expenditures than larger firms. It further suggests that SMEs are subjected to less social pressure about their environmental performance. It is held that, as a consequence of these factors, firm size will moderate the response of the firm to mandatory environmental disclosure requirements, regulatory requirements and social pressures for accountability. It is therefore hypothesised that:

H2 Firm size moderates the manner in which capital investment decision-making is influenced by:

- Mandatory environmental disclosure;
- Regulatory costs;
- Subsidisation; and
- Stakeholder opinion.
3.2.4.2 Industry Type

Studies of environmental disclosure suggest that firms in ‘dirty’ industries are subjected to greater scrutiny by both regulatory authorities and the general public (Adams, Hill and Roberts, 1998). The work of Baylis, Connell and Flynn (1998b) provides a comprehensive view of the relationship between environmental performance and industry type. They found industries close to end consumer markets (food industry and electrical sector) to be more motivated by public concern and customer pressure than industries which supply to other industries. They also note that differing levels of regulation and motivation by regulation are apparent between industries.

No research has been found which specifically considers the relationship between industry type and the environmental financial decisions of the firm. However, inferences may be drawn from a number of studies which relate industry type to environmental performance. Evidence indicates that more polluting industries (Hutchinson and Chaston, 1994) and those closer to end consumer markets (Baylis et al, 1998b) are more motivated by concerns for ‘environmental friendliness’. These concerns can logically be expected to put pressure on firms to give more consideration to environmental matters in their financial decision-making. Based on this rationale, it is hypothesised that:

H3 Industry type moderates the manner in which capital investment decision-making is affected by:
   - Mandatory environmental disclosure;
   - Regulatory costs;
   - Subsidisation; and
   - Stakeholder opinion.
3.2.5 Environmental Costs

The research question on environmental costs is drawn from the discussion in Chapter 2.8.2. The literature on environmental costs is limited. Research by Boyd (1998) and White et al. (1995) found that many USA firms consider only the most obvious environmental costs. Given that environmental clean-up costs are much higher in the USA than in Australia, it seems likely that Australian firms will be less concerned about environmental costs than USA firms. This expectation is supported by Parker’s (1998) study of Australian environmental costing practices, which indicates that environmental costing is not well developed in most Australian firms.

Although Parker (1998) touches on the application of environmental costs in capital budgeting, no Australian studies have been discovered which systematically examine the effect of environmental costs on capital investment decision-making. Parker’s research was limited to case studies and so a relatively small number of firms were investigated. White et al.’s (1995) study investigated whether respondents consider a range of environmental costs in their capital budgeting but does not measure the extent to which respondents consider each environmental cost. Although knowledge of costing of environmental factors considered in Australian capital investment decision-making is very limited, environmental costing literature from both Australia and USA suggests its importance to a fuller understanding of capital investment decision-making. The empirical work of this thesis using survey methodology and a much larger population, can provide a wider description of environmental costing in Australian firms. To address this deficit in the literature the following research question is proposed:
RQ 3 Which environmental costs have the most influence on the decisions of Australian capital investment managers?

3.3 Study Design: Research Method

The research objectives set out in section 1.5.1 are addressed by experimentation and passive observational methods. A completely crossed \(2^4 = 16\) cases factorial experiment is employed to gauge the influence of the social controls on the capital investment managers’ assessment of the acceptability of the capital investment. The selected social controls are mandatory disclosure requirements; regulatory costs; depreciation allowances; and stakeholder opinion on capital investment decision-making. Subsidisation in the decision cases is represented by depreciation allowances, as this is the most common form of environmental subsidisation for private firms in Australia.

The experiment measures the differential between better and worse than current levels of social controls, in a series of hypothetical cases. The difference between the better and worse levels indicates how responsive managers are to changes in each social control.

Weightings of the four social controls are also derived from the passive observation study. The passive observation study measures managers’ perceptions of the current Australian situation.

Passive observation was employed for the following purposes:

(i) To examine the influence of the moderating variables

(ii) To examine the influence of the social controls on selected attributes of the capital investment decision.
(iii) To provide a wider description of the dependent variable, capital investment decision-making. More particularly the use of environmental costing for capital investment decision-making by Australian firms is investigated.

The discussion in section 1.4 has influenced the choice of research methods. First, Gladwin’s (1993) criticisms of social and environmental research indicate that there is too little attention to causal directionality. This has been addressed by the choice of the experimental method, which is a strong method for establishing causality. Gladwin also notes that there is little attention to rigorous hypothesis testing and model building.

The choice between various research methods is “a trade off around reliability, internal and external validity, and their appropriateness to the research topic” (Gill and Johnson, 1997, p.134). Similar views are expressed by Brinberg and McGrath (1985, p.43), and Spector (1981, p.15). The need to make this compromise in the choice of a research method is raised by Trow (1957, p.33) who comments that:

...different kinds of information about man and society are gathered most fully and economically in different ways, and the problem under investigation properly dictates the method of investigation...This view seems to be implied in the commonly used metaphor of the social scientist’s ‘kit of tools’ to which he turns to find methods and techniques most useful to the problems at hand (cited in Gill and Johnson, 1997).

The ‘trade off’ is lessened in the empirical work of this thesis by the use of two research methods, which have counter balancing strengths and weaknesses.

From the ‘kit of tools,’ experimentation was selected as the most powerful and efficient method to investigate causality and interactions. Gay and Diehl (1992, p.382) assert that experimentation is “the only method of research that can truly test hypotheses concerning cause-effect relationships”. It allows the researcher to simultaneously manipulate a
number of variables, to determine both the individual effect of each and any interactions between the variables. The capacity of experimental methods to test for interactive effects between variables makes it particularly suitable for this research, in which the regulatory mix is significant.

Passive observation is a term used by Cook and Campbell (1988, p.295) to describe observation without intervention by the researcher. It may be thought of as the opposite to experimentation in that experimentation manipulates the variables, thus directly intervening in the situation. Whilst it is not as strong as experimentation in determining causality, the passive observation method’s strength lies in its generalisability. Thus, passive-observation has been selected as a suitable method to use, in combination with experimentation, for the ‘triangulation’ approach of this study.

Triangulation enables the researcher to minimise the problems inherent in the use of a single research method. Campbell (1988a, p.62) takes the view that:

...knowledge is always tentative and can be made incrementally more certain with increasing data or evidence. Once a proposition has been confirmed by two or more independent measurement processes, the uncertainty of its interpretation is greatly reduced. The most persuasive evidence comes through a triangulation of measurement processes.

This view of the strength in triangulation provides further support for the choice of the two research methods, viz., passive observation and experimentation.

3.3.1 The Experimental Method

As stated in Chapter One the primary purpose of the research is to determine the influence of selected social controls on capital investment decision-making. Experimentation is
posited to be an appropriate method for this research project because it “allows the researcher to control the research situation so that causal relationships among variables may be evaluated” (Zikmund, 1997, p.288).

3.3.1.1 Benefits and Deficiencies of Experimentation

Gill and Johnson (1997, p.129) note that the experimental method has “significant strengths of internal validity and reliability”. Milne and Chan (1999, p.445) further elaborate on the value of the experimental method:

Unlike surveys that capture attitudes, decision experiments measure behaviour. Also a greater degree of confidence can be placed on observed behavioural changes being the result of social information than with capital market studies.

Further justification for the choice of experimentation lies in the need for the use of more positive methods, which have been neglected by many green business researchers. Slater and Angel (1999, p.76) are critical of this neglect:

The recent literature available on green business tends to adopt a normative approach, without a sound analytical foundation for the prescriptions. Few studies have tried to understand the complexity of environmental choices and achieve links with established theories.

Although there are strong justifications for the use of experimentation, its limitations must be recognised. The main objection to experimentation relates to its possible lack of generalisability or “external validity” (Blalock, 1971). However, Blalock (p.140) suggests that concerns about generalisability may be lessened if the following view is adopted:

Rather than taking as the ultimate objective the goal of generalising to specific populations, I would maintain that it is preferable to attempt to state general laws that interrelate variables in terms of hypothetical “if-then” statements. These could be in the form, “If $X$ changes by one unit under conditions $A$, $B$ and $C$, then $Y$ should change by $b_{x}$ units.” In effect, then, I would consider generalizations to populations as means rather than ends.
Relying on Blalock's view, the "if-then approach" is adopted in the experimental work of this thesis. A key research objective of this study investigated by the experiment is to determine the relative importance of social controls in capital investment decision-making. In other words "to what extent do the social controls cause a change in capital investment decision-making?" An investigation of this cause and effect relationship, may be considered in Blalock's terms as "an attempt to state general laws that interrelate variables in terms of "if-then statements". The experiment corresponds to Blalock's example in that it measures the extent to which each of the social controls \((X_1, X_2, X_3, X_4)\) changes the capital investment decision-making of the firm \((Y)\). Although in this initial research, indications of these relationships could not be regarded as 'general laws', their benefit lies in the possibility of follow-up studies to test the strength of the relationships further.

Another approach to modifying concerns about experimentation is suggested by Cooper and Emory (1995, p.361):

As a rule of thumb first seek internal validity. Try to secure as much external validity as is compatible with internal validity requirements by making experimental conditions as similar as possible to conditions under which the results will apply.

Milne and Chan (1999, p.445) also highlight the importance of modelling reality as closely as possible:

The limitation with decision experiments, of course is that while they do measure changes in behaviour, they do so under controlled and hypothetical conditions. The extent to which such behaviour would be repeated in real decision situations is always open to debate. The level of confidence that can be placed in the experimental results often depends on how well the experimental conditions model reality.

Thus, experiments may be viewed as parsimonious, with simplifying assumptions resulting in loss of realism. However, a defence is provided by Weick (1979, p.173) who
considers that "a simple replica is an obvious place to launch an investigation." He cites Blalock's (1971, p.63) comment that, although an experiment may be initially unrealistic:

...by beginning with grossly oversimplified models a cumulative process can be set in motion in which one successively modifies the model or theory until it becomes more and more complex and provides a better fit to reality.

Some researchers do not agree that experiments are unrealistic. Kida et al (1990) point out that decision-makers typically reduce large amounts of numerical data into qualitative terms such as better or worse than last year, higher or lower than industry average etc. Keppel (1991. pp.481-2) suggest use of multiple factors provides realism in experiments:

Perhaps the most important advantage of multifactor experiments is the degree to which they begin to approximate the actual setting in which a given behavioural phenomenon naturally occurs. In this sense, then, we tend to increase our understanding of behaviour as we add more relevant independent variables to our experiments.

Relying on this advice, the experiment in this thesis uses both multiple factors and categorical levels of "better" and "worse" which Keppel and Kida et al maintain are similar to the real conditions of decision-making.

3.3.1.2 Use of Factorial Experimentation

Factorial experimentation was chosen as the most appropriate method to address Research Question 1 (that is, testing the relative importance of the independent variables in capital investment decision-making). Factorial experiments allow determination of joint effects of independent variables as well as independent effects. Joint effects are described as 'interactions' and independent effects as 'main effects'. In a factorial experiment all possible combinations of factors under study are tested. The advantages of factorial experimentation are summed up by Winer, Brown and Michels (1991, p.284):
Factorial experiments permit the experimenter to evaluate the combined effect of two or more experimental variables that are used simultaneously. Information obtained from factorial experiments is more complete than that obtained from a series of single factor experiments, in the sense that factorial experiments permit the evaluation of interaction effects. An interaction effect is an effect attributable to the combination of variables above and beyond that which can be predicted from the variables considered singly.

Possible interaction effects are considered significant in this study. A finding of interactive effects serves to indicate that the social controls may be more effectively applied in certain combinations, rather than individually.

3.3.1.3 Within-Subjects Experimental Design

A repeated measures or ‘within-subjects’ design is employed for the experiment, where all levels of treatment are applied to each subject. Boniface (1995, p.9) considers this “in general a more powerful design than the independent groups design”. Gay and Diehl (1992, p.401) note that the advantage of this design is that subjects are used as their own controls. Systematic differences between subjects are controlled by allocation of the treatments in random order. The within-subjects design does not compare one subject with another subject, but instead compares each subject’s score using one condition with the same subject’s score using another condition. The elimination of random error due to individual differences and multiple treatments possible for each subject results in increased power of the experiment according to Mitchell and Jolley (1992). They note (p.300) that “in the simplest case your subjects serve double duty by being in both control and experimental conditions”.

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Treatment carryover effects$^{27}$ are the major disadvantage associated with this design. However, as suggested by Mitchell and Jolley (p.302), practice prior to the experiment can minimise treatment carryover effects, since subjects will have already learned as much from practice as they can. Since the experiment imitates key elements of the decisions made on a regular basis by capital investment managers, the subjects are performing a task which is familiar to them.

3.3.1.4 Operationalising the Theoretical Variables and Constructs

Operationalisation is defined by Babbie (1995, p.132) as an extension of the conceptualisation process:

\[\ldots conceptualization \text{ is the refinement and specification of abstract concepts, and operationalization is the development of specific research procedures (operations) that will result in empirical observations representing those concepts in the real world.}\]

The development of operational definitions of concepts involves exact specification of ‘what’ is being observed and ‘how’ it will be carried out and interpreted. (Babbie, p.116), notes the importance of exact specification:

Strictly speaking an operational definition is a description of the “operations” that will be undertaken in measuring a concept. Others might disagree with our conceptualization and operationalization, but the definition would have one essential scientific virtue: it would be absolutely specific and unambiguous. Even if someone disagreed with our definition, that person would have a good idea of how to interpret our research results…

The measurements can be made with varying degrees of precision according to Babbie (p. 122). Although precise measurements are generally superior to imprecise ones, precision is not always necessary or desirable. Thus operationalisation of concepts should

$^{27}$ "The effects or side effects of an earlier treatment on responses in later trials" (Mitchell and Jolley, 1992, p.301).
"be guided by an understanding of the degree of precision required" (Babbie, 1995, p.123).

The degree of precision is also dependent on the extent to which accurate measurement is possible.

Campbell (1988a, p.63) uses the galvanometer to illustrate the difficulties of measurement. He points out that "no theoretical parameter is ever measured independently of other physical parameters." Methods of minimising "irrelevant physical forces" include orienting the galvanometer needle at right angles to gravity; reducing its mass; setting its axis in jewelled bearings; and counter-weighting the needle point. This may result in the galvanometer reading reflecting "almost purely, the single parameter of voltage..."

Campbell (p.63) adds that in the social sciences:

...we have no measures as carefully compensated to control all irrelevancies as is the galvanometer. There simply are no social science devices designed with so perfect a knowledge of all the major relevant sources of variation. They tap multiple processes and sources of variance of which we are as yet unaware. At such a stage of development, the theoretical impurity and factorial complexity of every measure are not niceties for pedantic quibbling but are overwhelmingly and centrally relevant in all measurement applications that involve inference and generalization.

Campbell (p.64) argues that absolute measurement is a "convenient fiction" and that "in all useful measurement, an implicit comparison exists when an explicit one is not visible."

He suggests (p.64) the use of randomised experimentation as the most satisfactory research method for "achieving interpretable comparisons":

In any event, the randomization strips of plausibility many of the otherwise available explanations of the difference in question... where possible, experimental design should by all means be exploited.
3.3.1.5 Variable Definition and Measurement

A major consideration concerning the variable definition and measurement is the selection of categorical levels. Many levels of environmental social controls are possible and testable. These could include a decrease in control, or increases to even higher levels. However, each increase in the number of levels has the major disadvantage of increasing the complexity of the experiment. To avoid this problem, testing is restricted to two levels. The use of levels and rationale for the election of these levels is provided below.

Use of Categorical Levels for the Independent Variables

Operationalisation of the independent variables is restricted to two levels, which are ‘better’ and ‘worse’. Better means ‘better than your last capital investment decision’ and worse means ‘worse than your last capital investment decision’. Kida, Cohen and Paquette (1990, p.358) comment on this use of categorical levels that “categorizing the data is not only required for ANOVA modelling, it is also a heuristic typically used in the decision process”. They point out that decision-makers, faced with large amounts of numerical data, translate it into qualitative terms to make the numbers meaningful. Thus “cues are often given different categorical descriptions such as above/below average, high/low, up/down, rising/falling etc”. An example of one of the 16 decision cases used in the experiment is shown in Exhibit 3.1. Respondents were asked to indicate the relative acceptability of the capital investment decision for each combination of levels of the social controls.28

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28 N/C in the scale means ‘no change’ in acceptability of the decision.
Exhibit 3.1
One of the Decision Cases Used in the Experiment:

<table>
<thead>
<tr>
<th>Investment #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>depreciation allowances</td>
</tr>
<tr>
<td>mandatory disclosure</td>
</tr>
<tr>
<td>stakeholder opinion</td>
</tr>
<tr>
<td>regulatory costs</td>
</tr>
</tbody>
</table>

Relative acceptability of project:

<table>
<thead>
<tr>
<th>N/C</th>
<th>Low acceptability</th>
<th>High acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

In a series of decision experiments Kida et al (1990) found that cue importance was significantly affected by the categories selected. Data were described as above/below average or rising/falling and the results indicated (p.368) that "when data were given the more dynamic categories of rising/falling, the $w^2$ importance measures were significantly greater than when data were categorized in a more static manner." However, "(t)he degree of association between importance weights was not affected by increases in task complexity" (Kida et al, p.367) They caution that decision experiments should either take into account the difference in weighting of cue categories, or cues should be operationalised in a similar manner when modelling decision functions. Relying on this advice, all the cue categories are defined in the same terms.

3.3.1.6 Dependent Variable

The influence of the independent variables (social controls) on the dependent variable (capital investment decision-making) is measured in the experiment in terms of an overall

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29 "The percent of judgement variance explained by a cue ($w^2$) is used as the importance measure in ANOVA modelling" (Kida et al, 1990, p.363).
assessment of the acceptability of the investment. In order to achieve a wider examination of the dependent variable, the passive observation study is used to examine a variety of attributes of capital investment decision-making. These include both environmental and non-environmental attributes of the decision. The discussion of the passive observation study which follows, further illuminates the examination of these attributes.

3.3.2 The Passive-Observational Research Method

Observational research methods involve systematic observation of naturally occurring events, without intervention from the researcher. Cook and Campbell (1988, p.295) use the term ‘passive-observation’ to describe observation without any intervention by the researcher. They note (p.295) that:

Correlations in the ordinary sense are what one looks for in experiments as well as in descriptive studies of the non-experimental sort. In both cases, one is interested in discovering whether certain variables co-vary with others, irrespective of whether any of the variables is manipulated.

Passive observational research results, relying on larger sample sizes, have strength in that the findings are more generalisable than those of experimentation. Passive-observational approaches in combination with appropriate statistical analysis may be used for the purpose of causal inference, according to Cook and Campbell. However, they lack the strength of experiments in identifying causal relationships because there is less control over extraneous variables.

Campbell (1998a, p.62) observes that “once a proposition has been confirmed by two or more independent measurement processes, the uncertainty of its interpretation is greatly reduced.” Relying on this view, the passive observation study will be employed in
combination with experimentation to provide evidence of the relative influence of the social controls. While the experiment examined only the overall acceptability of the capital investment proposal, the passive observation study examines a range of attributes of the social controls. Additionally, this section of the study will be used to:

- Compare the relative influence of environmental factors with mainstream financial and strategic factors in the capital investment decision; and
- Investigate the influence of firm size, industry type and individual manager disposition on the decision; and
- Investigate the dimensions of capital investment decision-making.

### 3.3.2.1 Components of the Passive Observation Study

Stage One of the study is the passive observation study. The selection of the indicators was based on evidence derived from the literature, about attributes of the social controls which have a likely influence on the capital investment decision. The rationale for the selection of indicators for each social control and also for the mainstream financial and strategic factors is detailed below. An example of one indicator is shown in Exhibit 3.2 below.

The scale selected was a seven-point scale. However, during the pilot studies some managers felt the need for a 'not applicable' category, which was subsequently included. The respondents were asked to indicate the degree of influence of each indicator. This use of scaling and other research methodology considerations are discussed in section 3.4.
Exhibit 3.2
Indicator for Influences on the Capital Investment Decision

<table>
<thead>
<tr>
<th></th>
<th>Not Applicable</th>
<th>Low Influence</th>
<th>High Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>C5 Cost of environmental training of employees</td>
<td>N/A</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

The four parts of the passive observation survey are:

Part 1: Mandatory Disclosure and Subsidisation.

Part 2: (i) Regulatory Costs.
   (ii) Stakeholder Opinion.
   (iii) Environmental Costs.

Part 3: Mainstream Financial and Strategic Factors.

Part 4: Demographic Information.

The indicators used for each of these sections of the survey are set out below.

3.3.2.2 Mandatory Disclosure and Subsidisation

Mandatory disclosure requirements do not apply equally to all firms, since some accounting standards are industry specific. For instance, AASB 1022 “Accounting for the Extractive Industries” means extractive industry firms must make more environmental disclosures than firms in other industries. Additionally, environmental disclosure requirements of accounting standards and corporations law may be expected to have the greatest influence on publicly listed companies because their annual reports attract greater public interest and are subject to scrutiny by investors, analysts and other stakeholders. Smaller firms and proprietary companies may attract less public interest. Subsidisation in Australia is largely indirect, restricted to taxation concessions (for capital investments
these are depreciation allowances). Direct subsidies are uncommon. To allow for the possibility that the respondent may be unaware of subsidies or disclosure requirements, the indicators for mandatory disclosure and subsidisation are preceded by questions to gauge the respondents' level of awareness of these factors.

3.3.2.3 **Mandatory Disclosure Indicators**

The influence of mandatory disclosure will be gauged by four measures which are set out in Exhibit 3.3. These are based on the evidence noted in section 2.2 which indicates that environmental disclosure requirements have a likely financial impact on the firm, through effects on share price (Zeff, 1978; Girardi, 1999) and costs of borrowing and insurance (Wright, 1998, Girardi, 1999, Schmidheiny and Zorraquin, 1998). These costs are expected to influence the firm to invest in cleaner (less polluting) plant and equipment.

To test this expectation, three main sources of requirements for mandatory disclosure, which are accounting standards, corporate law and the National Pollutant Inventory were selected as indicators. An additional indicator was included which asks whether respondents are aware of expected increases in accounting standard disclosure requirements. This indicator is drawn from the discussion in section 2.4.1 of the development of an international accounting standard for disclosure of environmental liabilities and Australia's obligation through the International Harmonisation Agreement, to produce a similar standard. If accounting standard disclosure requirements are effective in influencing pro-environmental behaviour, expectation of increases in disclosure requirements should magnify this effect.
3.3.2.4 Subsidisation Indicators

The main form of environmental subsidisation in Australia is tax concessions in the form of depreciation allowances for environmental capital expenditure. It is expected that most capital investment managers would be aware of these tax concessions. The subsidisation indicators are set out in Exhibit 3.4 below.

The first indicator is based on the work of Rae (1997), which suggests that depreciation allowances and rebates through the tax system are the most important form of subsidisation in Australia. This indicator is therefore included to measure the degree of its influence. Part (ii) of question 2 is drawn from the study of small firms by Zhuang and Synodinos (1997) which suggests that small firms lack the resources to be environmentally conscious and from Rae’s (1997) suggestion that in some situations the desired behaviour is unlikely to occur without a financial incentive.

It is posited that many small firms are likely to be in this situation and with low incomes may find subsidies through the tax system less motivating than a direct payment.
This indicator is included to measure the likely influence of direct subsidisation on all firms, although it is of particular interest in relation to size effects.

*Exhibit 3.4
Subsidisation Indicators*

<table>
<thead>
<tr>
<th>S1 Please indicate the degree to which environmental depreciation allowances influence your capital investment decisions?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Influence</td>
</tr>
</tbody>
</table>

S2. (i) Are you aware of any direct subsidies/grants received by your firm to aid in making environmental improvements?

1. No  □  Skip to Section 2
2. Yes □

If Yes please answer Part (ii)

(ii) To what degree do these subsidies/grants influence your capital investment decisions?

| Low influence | 1 | 2 | 3 | 4 | 5 | 6 | 7 | High influence |

The use of grants and direct subsidisation in Australia to promote improved environmental performance is very limited, may be of insufficient materiality or may be unrelated to capital investment. It is thus conceivable that the capital investment decision-maker may be unaware of any environmental subsidies. Question S2 part (i) is included to determine the respondent’s extent of awareness of subsidisation and to screen out respondents who could not validly answer the second part. Part (ii) measures the extent to which grants or direct subsidies influence investment managers of firms receiving some form of environmental subsidy.

### 3.3.2.5  Regulatory Indicators

The regulatory indicators are used to gauge the influence of a range of regulatory costs and penalties on the capital investment decision. The indicators are listed in Exhibit 3.5.
These indicators are drawn from the work of EPA (NSW) (1994) (discussed in section 1.3.2 and section 2.2), which indicates an interest in the extent to which newly implemented regulatory measures will stimulate increased capital investment. This leads to the expectation that regulatory costs, if properly implemented, will influence pro-environmental behaviour in firms.

A range of regulatory costs relevant to Australian firms has been selected, to measure this influence. The first indicator ‘charges for emissions to air/water,’ was drawn from the EPA (NSW) (1998) discussion of the introduction of load-based licensing (LBL). EPA (NSW) suggests that the influence of charges such as LBL, which increase with pollutant load, will be greater than that of the superseded command and control regulation. It is posited that this influence will lead to more pro-environmental capital investment decision-making.

The same rationale applies to the other costs selected as indicators. Indicators R2 and R4 to 7 were drawn from the work of Bates (2000) who points out that hazardous waste disposal, possible liability for owners, occupiers and lenders for site clean-up, asset impairment and shut down of facilities are very costly to firms. Although Australia’s regulatory approach to these problems may be considered to be less confrontationist than that of the USA, these studies lead to the expectation that these costs will be a significant consideration for even wealthy firms. Indicator R3 is drawn from the work of Verbeke and Coeke (1997) which suggests that firms may be resentful of increases in environmental taxes and respond in an adverse way. This indicator has been included to measure the influence of expectations of increases in environmental taxes and charges (compliance costs) on capital investments of organisations.
Exhibit 3.5

Regulatory Indicators

<table>
<thead>
<tr>
<th>R1</th>
<th>Charges for emissions to air/water</th>
</tr>
</thead>
<tbody>
<tr>
<td>R2</td>
<td>Hazardous waste treatment or disposal</td>
</tr>
<tr>
<td>R3</td>
<td>Expectation of future increases in compliance costs</td>
</tr>
<tr>
<td>R4</td>
<td>External property damage</td>
</tr>
<tr>
<td>R5</td>
<td>Internal property damage</td>
</tr>
<tr>
<td>R6</td>
<td>Natural resource damage</td>
</tr>
<tr>
<td>R7</td>
<td>Site restoration/remediation</td>
</tr>
<tr>
<td>R8</td>
<td>Environmental fines/penalties</td>
</tr>
<tr>
<td>R9</td>
<td>Licences/permits</td>
</tr>
</tbody>
</table>

However, there is some overlap between these two groups. For example, hazardous waste disposal and emissions to air and water might be classified as both regulatory and production costs, since the wastes are a necessary part of production but their disposal is strictly monitored and regulated. Charges for waste emission and disposal are controlled by government and could potentially be an incentive for firms to invest in less polluting equipment. Contingent costs include expected increases in charges, and fines and charges arising from spillages, which might also be categorised as regulatory costs.

3.3.2.6 Stakeholder Opinion Indicators

The nine stakeholder indicators used to measure the extent of influence of various stakeholders are set out in Exhibit 3.6. Indicators SH1 to SH4 are drawn from the work of Schmidheiny and Zorraquin (1998) and Gunningham et al (1999) which indicate that investors, financial analysts, bankers and other creditors, insurers and credit rating agencies as providing financial penalties for poor environmental performance. It is posited that this influence leads to firms increasing pro-environmental capital investment. Indicator SH9
was based on Tilt's (1994b) work in which the influence of green pressure groups on the firm was found to be significant in influencing increased environmental disclosure. Although this study did not extend to examining the influence on environmental performance, it is posited that increases in pro-environmental capital investment are another likely response. Thus green pressure groups are included to test this proposition.

*Exhibit 3.6*

*Stakeholder Opinion Indicators:*

<table>
<thead>
<tr>
<th>SH1</th>
<th>Investors</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH2</td>
<td>Insurance companies</td>
</tr>
<tr>
<td>SH3</td>
<td>Banks/creditors</td>
</tr>
<tr>
<td>SH4</td>
<td>Credit rating agencies</td>
</tr>
<tr>
<td>SH5</td>
<td>Employees</td>
</tr>
<tr>
<td>SH6</td>
<td>Customers</td>
</tr>
<tr>
<td>SH7</td>
<td>Suppliers</td>
</tr>
<tr>
<td>SH8</td>
<td>Competitors</td>
</tr>
<tr>
<td>SH9</td>
<td>Green pressure groups</td>
</tr>
</tbody>
</table>

Indicators SH 6, 7 and 8 are drawn from Gray, Owen and Adam's (1996) study which indicates the influence of suppliers, customers and competitors as stakeholders of the firm. These indicators are included to determine whether this influence extends to capital investment.

### 3.3.2.7 Environmental Costs

Part 2 (c) of the questionnaire addresses the research question on environmental costs. The indicators selected were drawn from the work of White et al (1995) and EPA (USA) (1995) which suggest costs with potential to influence capital investment managers. EPA (USA) (1998) suggest firms consider environmental costs arising from production, environmental compliance, contingent costs, image and relationship costs. Since social
controls such as regulation, mandatory disclosure and stakeholder opinion impose costs which may be viewed as 'environmental', the influence of some environmental costs is measured in other aspects of this study. To widen the range of costs measured in the study, environmental costs which are not captured within the scope of costs arising from the social controls are included in this section of the study. Also some cost indicators were included which could (arguably) have been classified as regulatory indicators. For example, 'air/wastewater/hazardous waste disposal' is the cost of disposing of production wastes but many of these charges are imposed by regulatory authorities. As such a similar indicator was included in the regulation aspect of the study.

Exhibit 3.7 sets out the factors examined in this section of the study. Respondents were asked to indicate the influence of each of these costs in their last capital investment decision. A seven-point scale with end points labelled "low influence" and "high influence" was used for the cost indicators. A not applicable (N/A) category was also included and was measured as zero influence.

*Exhibit 3.7*

*Environmental Cost Indicators*

<table>
<thead>
<tr>
<th>C1</th>
<th>Environmental research costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2</td>
<td>Environmental design costs</td>
</tr>
<tr>
<td>C3</td>
<td>Energy costs</td>
</tr>
<tr>
<td>C4</td>
<td>Cost of environmental training of employees</td>
</tr>
<tr>
<td>C5</td>
<td>Air/waste water/hazardous waste monitoring</td>
</tr>
<tr>
<td>C6</td>
<td>Air/waste water/hazardous waste disposal</td>
</tr>
<tr>
<td>C7</td>
<td>Waste reuse</td>
</tr>
<tr>
<td>C8</td>
<td>Waste recycling</td>
</tr>
<tr>
<td>C9</td>
<td>Off-site hazardous waste treatment and disposal</td>
</tr>
<tr>
<td>C10</td>
<td>Off-site hazardous waste transport</td>
</tr>
<tr>
<td>C11</td>
<td>Water costs</td>
</tr>
<tr>
<td>C12</td>
<td>On-site hazardous waste storage and handling</td>
</tr>
<tr>
<td>C13</td>
<td>On-site air emission controls</td>
</tr>
<tr>
<td>C14</td>
<td>Reporting to government agencies</td>
</tr>
<tr>
<td>C15</td>
<td>Sales of environmentally friendly/green products</td>
</tr>
</tbody>
</table>
3.3.2.8 Mainstream Financial and Strategic Indicators

The mainstream financial and strategic factors are measured in the passive observation study for comparison with the influence of the environmental factors. Ten measures of the influence of financial and strategic factors on the capital investment decision-making were drawn from Butler et al’s (1993) work. These factors are included in order to compare their influence with that of environmental factors.

Although Butler et al (p.79) did not test environmental factors, their study of financial and strategic factors found “remarkably consistent ranking of investment attributes” in their survey instrument and “broadly similar findings” in structured interviews. Their top-ranked attributes have therefore been selected as the mainstream attributes to be tested in this study. They classify their indicators (p.71) as ‘financial’ and ‘strategic’, with strategic indicators being those which rely on “disaggregated data (data on the market, quality, productivity, and so on)”. Financial indicators according to this definition are the aggregated measures such as IRR or Payback. Butler et al’s classification of financial and strategic indicators will be followed in this thesis. Accordingly, N1 to N6 are held to be strategic indicators and N7 to N10 financial indicators. These indicators are listed in Exhibit 3.8.
Exhibit 3.8
Mainstream Financial and Strategic Indicators

F1 Fit of project with business strategy
F2 Growth of market related to project
F3 Competitive position of company/unit (vis-à-vis external competition)
F4 Effect on product quality
F5 Effect on productivity
F6 Effect on achievement of profit and sales targets for the project
F7 Internal rate of return for the project
F8 Return on assets for the project
F9 Net present value for the project
F10 Payback period for the project
F11 If payback period is used, what is the number of years generally required for payback?

3.3.2.9 Demographic Information

The principle use of the demographic information is the investigation of size and industry effects. Data from the passive observation section of the questionnaire\(^{30}\) is segregated according to firm size and industry type using demographic information derived from the organisational description section of the survey.

Two indicators of firm size, viz., number of employees and annual sales revenue were selected. Additionally these indicators will be judged in combination with industry type, since a ‘small’ firm in one industry may be quite different to a ‘small’ firm in another industry.

\(^{30}\) The data from the experiment will not be analysed in these groupings, as the experimental controls are designed to limit the influence of other variables in order to gain stronger indications of the influence of the independent variables.
The organisational description section is used to group the respondents according to industry sensitivity and firm size. The respondents were asked to indicate the industry(s) in which their firm operates. Additionally, bio-data characteristics were collected for the following reasons:

(i) As a means of checking that the respondents and their firms fitted the selection criteria;

(ii) To enable the data to be categorised according to various criteria such as industry type and firm size.

The respondents were asked to provide the following information about their firm and themselves:

- The organisation’s business structure (public/private company).
- Approximate number of full time employees.
- Total annual sales as reported in last year’s financial statement.
- Principle industry in which their organisation operates.
- The range (ie dollar value) of capital investment decisions they make.
- Whether they are the only person involved in making the decision.
- Number of years’ experience in capital investment decision-making; and
- Details of affiliation with accounting organisation(s).

The firm data was used to ensure that the firm was from an appropriate industry and for categorising firms according to size and industry type. Respondent data was used principally to ensure that the respondent was involved in making capital investment decisions and had sufficient experience to be capable of providing relevant information. Two respondents completed the survey but indicated that they did not make capital
investment decisions or had no experience. Their responses were therefore considered unusable. A summary of the data follows.

3.3.2.9.1  Company Statistics

(i)  Industry Sectors

Paper, petroleum, textiles and footwear, printing industries and the chemical sector had relatively low numbers of respondents. The three sectors with the largest number of respondents were food (N = 62), metals (N = 56) and extractive (N = 55). These three industries will be examined for evidence of industry differences, in the investigation of Hypothesis 3.

(ii)  Company Type

The companies were classified as publicly listed; proprietary companies and “other”. Thirty four percent of the companies were public, sixty two percent proprietary and four percent “other” (mainly co-operatives). The relative proportions of these company types is shown in Figure 3.1.

Figure 3.1
(iii) Range of Capital investment Decisions

The managers were asked for information about their capital investment decisions as follows:

(a) The smallest and largest capital investment decisions they made. Amounts given for the smallest decision ranged from $1 to $20,000,000. The most commonly cited amount was $1000 (24%). Amounts for the largest decision ranged from $10,000 to $550,000,000, with a fairly even distribution of amount between the bottom and top of this range.

(b) Number of Employees: The number of employees ranged from 2 to 1,000,000 with a median of 156.

Sales: The annual sales of the respondents companies ranged from $50,000 to 40,000,000,000 with a mean of $462,000,000. The annual sales figure appears to be a sensitive issue for some companies and 20 respondents declined to answer this question.

3.3.2.9.2 Manager Statistics

(i) Years of Experience: ranged from 1 - 45 years (mean 14 years).

(ii) Accounting Affiliation: Figure 3.2 summarises the information about the managers accounting affiliations. The majority of managers had an accounting affiliation, and as may be seen in the chart, the CPA Society was the association most represented among the managers.
(iii) Are you the only person involved in making capital investment decisions? Only 11 respondents (4.7%) indicated that they were the only person involved in making capital investment decisions. Overwhelmingly, managers do not make capital investment decisions in isolation.

### 3.3.3 Statistical Tests

The statistical tests used in the study are set out below. In the use of these tests, statistical conclusion validity is an important consideration. Cook, Campbell and Peracchio (1990, p.497) note that “most investigators want to decide whether a treatment has had some effect, no effect, or whether no decision can be made at present”. Cook and Campbell (1988, p.40) further explain that “statistical analysis is primarily used for deciding whether a presumed cause and effect co-vary”. They list (p.39) the important considerations:

(i) Is the study sensitive enough to permit reasonable statements about co-variation?

(ii) If it is sensitive enough, is there any reasonable evidence from which to infer that the presumed cause and effect co-vary? and

(iii) If there is such evidence, how strongly do the two variables co-vary?
Statistical power analyses have the function of determining the "magnitude of the effect that could have been 'reasonably' detected in the study" (Cook and Campbell, p.40) at a given confidence level. Statistical conclusion validity has been addressed in this study by the presentation of its statistical results in terms of (a) statistical power to detect differences; (b) significance level chosen for the tests; and (c) effect size. In the following sections the statistical techniques used in this study are set out.

These are first, analysis of variance (ANOVA) used for the within-subjects experiment and second, multiple regression analysis used for the passive observational between-subjects section of the study. The analysis of data was carried out using SPSS 10.0 for Windows, which is described as "a sophisticated piece of software used by social scientists and related professionals for statistical analysis" (Coakes and Steed, 2001). SPSS was chosen for use in this study because as noted by Coakes and Steed it is a reliable and widely accepted statistical analysis package which provides the facility for analysis of experimental factorial designs.

3.3.3.1 Analysis of Variance

Analysis of variance (ANOVA) was employed to set out the effects of the social controls on the capital investment decision-making. Its use is described by Myers and Well (1995, p.6):

Statistical tests are procedures for determining whether differences among treatment conditions are likely to be "real" (i.e., due in part to the individual or joint effects of the independent variables) or whether they could easily be due solely to error variability.

In a set of procedures referred to as analysis of variance (ANOVA), tests are based on the partitioning of variability in the dependent variable. Components of variability associated with the main effects of the factors and the joint effects of combinations of factors are obtained and compared with the component that reflects error variability.
Thus ANOVA is held to be suitable for analysis of the experimental data, where the purpose is to determine main effects and interactions between variables. The assumptions which must be met in order to correctly apply ANOVA are set out by Kleinbaum et al (1998, p.345):

(i) Random samples are selected from each of \( k \) populations or groups.

(ii) A value of a specified dependent variable is recorded for each experimental unit sampled.

(iii) The dependent variable is normally distributed in each population.

(iv) The variance of the dependent variable is the same in each population (this common variance is denoted as \( \sigma^2 \)).

Kleinbaum et al comment that “it is a rare instance when these assumptions hold exactly”. They note that ANOVA is robust and has broad applicability. For example “the normality assumption does not have to be exactly satisfied as long as we are dealing with relatively large samples”. However, he cautions that care must be taken to ensure that observations are independent because “violations of the assumption of independence can lead to very serious errors in inference…” This caution is noted and examination of the plots of the residuals and correlation matrices has lead to the conclusion that these assumptions were substantially met for the experimental data. The passive observational data did not in a few instances meet the normality assumption. This was mainly for the mandatory disclosure indicators, where the distribution was negatively skewed. Further testing was carried out for this data and this is detailed in the following section.
3.3.3.2 **Analysis and Interpretation of the Passive Observational Data**

In this section some observations are made about the analysis and interpretation of the data from the passive observational study. These are concerned with:

(i) The nature of the indexes for each variable (social control measure).

(ii) The interpretation of the influence scores.

(iii) The assumptions of normality underlying the use of parametric testing.

(iv) The comparison of weightings from the experiment with those of the passive observational study.

3.3.3.3 **The Nature of the Indexes for Each Variable (Social Control)**

For each manager: mainstream financial and strategic; disclosure; subsidisation; regulation; and stakeholder opinion scores were calculated from the indexes discussed above. A mean score was calculated for each respondent’s rating of influence for the multiple indicators of each variable (the rationale for the choice of indicators for each index was set out in section 3.3.2). The exception to this was that only one indicator (influence of depreciation allowances for environmental investments) was used in the case of subsidisation. The subsidisation score was therefore the score for this response. A mean environmental score was also calculated by adding the total mean scores from the indexes for the four social controls.

In order to ensure that the indicators used for each index all measure the same thing they were assessed using Cronbach’s Alpha, which is described by Bland and Altman (1997) as a measure of internal consistency. The Cronbach’s Alpha scores for each index were
found to be high (above .85 in all cases), suggesting that all the indexes constructed possessed a high degree of internal consistency.

3.3.3.4 The Interpretation of the Influence Scores

Two issues must be kept in mind in interpreting the influence scores:

3.3.3.4.1 The Use of the N/A (not applicable) Alternative

As an example, two likely reasons why a respondent might choose N/A for air emissions are (1) no air emissions are produced by the firm’s activities or (2) air emissions are produced but not considered in capital investment decision-making. It is not possible to determine the reasons for the respondent’s choice of the N/A score. However, in terms of influence of the indicator, the outcome is the same - it is not considered in the respondent’s capital investment decision-making. Based on this reasoning, N/A was scored as zero, since a N/A score means that the respondent does not consider the factor in capital investment.

3.3.3.4.2 The Assumptions of Normality Underlying the Use of Parametric Testing

Concerns that the normality assumption could not be met for some data arose especially for the mandatory disclosure indicators, where the large number of zero influence scores resulted in negatively skewed distributions. This left some uncertainty about whether non-parametric tests should be used.

Norusis (2000, p. 335) recommends “(w)hen in doubt use them both! If you reach the same conclusions on both types of tests, there’s nothing to worry about.” Bryman and Cramer (1997, p.117) also provide some reassurance on this point suggesting that parametric tests
are robust and can withstand violations of the normality assumption. They cite examples from Boneau (1960) and Games and Lucas (1966) where samples were set up to violate the assumptions of normality and equal variance. They found that results of analyses of these samples using parametric tests did not differ greatly from results for similar samples, which did not violate these two assumptions.

To determine whether the recommendation of Norusis could be accepted, analysis of the data was repeated using non-parametric measures. The Mann-Whitney U test which is the non-parametric equivalent of the t-test was used to test all ordinal survey data and the Friedman two way ANOVA was used in place of the parametric ANOVA. As these non-parametric tests resulted in the same conclusions as the equivalent parametric tests, only the parametric test data has been reported.

3.3.3.4.3 Comparison of Experimental Weightings With Passive Observation Influence Scores

Although it might be tempting to compare the weightings derived from the experiment with the passive observation influence scores, there are a number of important differences which must be kept in mind. These differences are set out below:

(i) The experiment employs hypothetical better and worse levels to test managers’ responsiveness to variations in the social controls. In comparison the passive observation study tests managers’ responsiveness to current levels of the social controls.
(ii) Proportionate representation of the industry sectors between the two stages of the study is slightly different. Principally, in the experimental study the proportion of managers from the chemicals industry is somewhat higher.

(iii) Individual differences in the respondent groups for the Stage 1 and Stage 2 may have biased the Stage 2 sample towards more pro-environmental individuals\(^{31}\). The Stage 2 respondents were not randomly selected, but were those respondents who agreed to participate in the Stage 2 study. Respondents disposed to undertake Stage 2 of the study are possibly more interested in environmental issues or more disposed towards social responsibility.

(iv) The experiment use one collective term for each social control such as 'regulation', and 'stakeholder opinion', whereas the passive observation study uses a range of attributes (indicators) of each social control.

The scores derived from the two studies therefore do not measure the same thing and are not directly comparable. However, an evaluation of the outcomes of the two studies in light of the above differences yields some useful observations. These are presented in Chapters 4 and 5, accompanying the discussion and conclusions about each component of the study.

### 3.4 Research Implementation Strategy

This section sets out the implementation of the study design. Section 3.4.1 provides details of the layout of the questionnaire. Section 3.4.2 on survey methodology explains the

\(^{31}\) An investigation of individual manager disposition towards the environment was not planned in the empirical work of this study. However, it is possible that this variable may be moderating the responses by managers of the stage 2 study in their weighting of the independent variables.
choices made in the construction of the survey instrument. Section 3.4.3 details the study population and sample selection. Section 3.4.4 discusses the pilot study and its results. Section 3.4.5 describes the delivery of the data collection.

### 3.4.1 The Questionnaire

A self-administered (mail) questionnaire was employed for implementation of both the experiment and passive observation study. The questionnaire was divided into two main stages; the first stage contained the passive observation study and demographic questions about the firm and the respondent. The second stage contained the experiment and was sent to those Stage 1 respondents who indicated willingness to participate in Stage 2. The organisation of the questionnaire is set out in Exhibit 3.9

#### Exhibit 3.9

*Organisation of the Questionnaire*

<table>
<thead>
<tr>
<th>Introductory explanations and definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
</tr>
<tr>
<td>Part 1: Mandatory Disclosure and Subsidisation</td>
</tr>
<tr>
<td>Part 2:</td>
</tr>
<tr>
<td>A. Regulatory Factors</td>
</tr>
<tr>
<td>B. Stakeholder Opinion</td>
</tr>
<tr>
<td>C. Environmental Costs</td>
</tr>
<tr>
<td>Part 3: Mainstream Financial and Strategic Factors</td>
</tr>
<tr>
<td>Part 4: Demographic Information</td>
</tr>
</tbody>
</table>

#### Stage 2

| Part A: Experiment                       |
| Part B: Investment Manager Assessment    |
3.4.2 Survey Methodology Considerations

The advice of Dillman (2000) was followed for the layout of the survey questionnaire and survey questions. Issues on which decisions were required principally included the choice of response scale and for the mandatory disclosure items where not all respondents were expected to be able to respond to all parts of the item, “skip” instructions were used. These two issues are discussed in sections 3.4.2.1 and 3.4.2.2 below.

3.4.2.1 Scaling

The influence of each of the social controls on the capital investment decision was gauged by the manager’s response to a set of indicators, which are held to be characteristic of that social control measure. The influence of each indicator was measured by the use of a rating scale. The ends of the scale were labelled 1 = low influence and 7 = high influence, with no verbal labels for points 2 through to 6. In each case the respondent was asked to rate the degree of influence of the indicator by circling the appropriate number. This is shown in Exhibit 3.10 below.

Exhibit 3.10
Rating Scale for Indicators
The length of the response scale was based on the work of Scherpenzeel and Saris (1997), and Alwin (1997). Scherpenzeel and Saris's research (p.367) found that "a number scale ranging from 0 to 10 has a much higher validity and reliability than a number production scale ranging from 0 to 100". Alwin (p.322) made a similar assessment:

Cognitive theorists would suggest that there may be some practical upper limit on the number of response categories people can handle. Certainly given the potential cognitive difficulties that most people have in making discriminations along a scale with numerous categories, it seems plausible to argue that the quality of measurement will improve up to some point, say 7 categories, but beyond that information will actually be lost because the scale points tend to mean less.

Relying on this advice, a seven-point scale was initially chosen for all response scales in the study. However, this was modified after the pilot studies were conducted (see section 3.4.4 for more detail on this point) to include a 'not applicable' (N/A) category. In the case of the mandatory disclosure and subsidisation indicators the N/A category was replaced by 'skip' instructions. However, for the purposes of statistical analysis, N/A and skipped responses were both counted as zero.

3.4.2.2 Navigational Compliance Instructions

Redline and Dillman (1999) investigated the use of various methods of presenting navigational compliance. These include 'skip' instructions where the respondents are asked to skip to the next question if the remainder of the question is not relevant to them. They found that respondents may ignore a skip instruction if presented incorrectly. A number of methods to aid respondents follow skip instructions correctly are suggested by Redline and Dillman. These include increasing the boldness and/or the size of the skip instruction and use of an arrow to direct the respondent to the non-skip response option. These methods were used in the mandatory disclosure section of the questionnaire and an example is shown in Exhibit 3.11.
3.4.3 Sample Selection and Study Population

The firms were randomly selected from manufacturing industry firms in the industry sectors noted in section 3.3.28. The Kompass Data Base was use to identify firms in the industries selected for study. Kompass is a data base of Australian business-to-business firms. Important factors considered in the choice of the study population are related to the probable significance of industry differences. Specific requirements applying to one or few industries afford an opportunity for inter-industry comparisons. Industry differences include:

1. The extractive industries, which are required to make disclosures of an environmental nature under accounting standard AASB 1022 “Accounting for the Extractive Industries”. There are no similar requirements for other industries, even though many of the provisions (and concerns) could equally apply to other industries. A disclosure effect related to this requirement in the mining industry could indicate the need to extend similar provisions to other industries.
2. Industries close to end consumer markets, such as food and pharmaceuticals were found by Baylis et al (1998) to be more affected by customer pressure than machinery manufacturing firms, which supply predominantly to other industries. Similarly firms in industries frequently targeted by green pressure groups (such as petrochemical and pulp and paper) have been found to be more affected by environmental concerns. Some indication of the extent to which these added pressures influence capital investment decision-making can be gained by comparison with firms which are less subject to public attention.

3. Food and mechanical sectors were noted often to fail to recognise that they have harmful environmental impacts. Baylis et al suggest that this may be attributed to the large number of small firms in these industries.

Based on these considerations the study population selected was ‘capital investment managers of Australian firms’. The industries selected were the extractive industries, and manufacturing industries (food, pharmaceuticals, petrochemical, pulp and paper, heavy metal). The study population was randomly selected from firms in industries with sufficient environmental impact to invite attention from EPA and the public.

3.4.4 Pilot Study

The research instrument was pilot tested by a series of one-hour interviews with capital investment managers within a one-hour drive radius of the investigator. Piloting was done by personal presentation of the instrument, to enable the investigator to observe the respondent’s behaviour and clarify any ambiguities or confusing aspects of the survey, which may have been found. The financial managers were asked to “think aloud” as they
completed the questionnaire. Any confusing aspects were then marked during the interview for later correction. These interviews were also used as a means of gauging completion time for the questionnaire, to ensure that the survey was not too long.

The pilot tests were conducted in six firms. Two firms were publicly listed multinationals, the remainder were smaller proprietary companies. Initially the criteria for selection of managers to pilot test the questionnaires were limited to "managers involved in making capital investment decisions". This resulted in interviews with two facilities managers, an engineering manager and an environmental manager. These managers consistently commented that they would not explicitly consider depreciation allowances (or other forms of subsidisation) or regulatory costs, because these costs would be subsumed within financial estimates such as net present value calculations. This lead to the belief that the focus on finance and cost factors in the questionnaire required the survey to be directed to financial managers involved in capital investment decision-making. Subsequent pilot testing, carried out with financial managers, yielded a more satisfactory outcome.

As noted earlier, the response scale was modified as a result of the pilot testing. Several managers suggested that a 'not applicable' category should be included in the scale because (mainly for industry or firm specific reasons) some indicators were not applicable to their decision-making.
3.4.5 Research Instrument Delivery

The data collection was achieved through a two stage, mail-delivered survey questionnaire. The decision was made to use a mail-delivered questionnaire for the following reasons:

- A large population is required for the passive observation study.
- It is a national study designed to gain information about decision-makers in all areas of the country. Telephone calls would incur prohibitive costs in terms of both time to make the calls and expense of long distance calls.

Research evidence (Scherpenzeel and Saris, 1997) found that mail surveys are more reliable than various forms of computer-aided surveys and telephone surveys. This conclusion relied on their own empirical work and a meta-analysis of twelve other studies. This conclusion is supported by Dillman (1998, p.14) who comments on the relative merits of interviews and surveys:

A substantial amount of work on survey measurement has not produced evidence that interview methods are inherently superior for producing data. In fact, the reverse may be true. There is fairly strong evidence interview methods, whether in person or by telephone, yield more socially desirable answers and respondent acquiescence than do self-administered methods....

The survey was delivered to 1000 randomly selected firms in the industry groups selected for study. The recipients received a survey questionnaire along with a covering letter explaining the importance of the study, how the respondent was chosen and why it is important to the respondent to return the completed questionnaire. Also an offer was made to send the recipient a summary of the results of the study as an incentive to complete the questionnaire (the covering letter is included in Appendix One, Part 1).
The first stage of the survey was used to gather passive observational data on the four social controls (i) mandatory disclosure (ii) subsidisation (iii) regulation, and (iv) stakeholder opinion. As well the data collected in this stage included a series of indicators of the influence of environmental cost and the demographic data. This stage was used to request that the managers participate in the second stage of the study.

To improve response rates a follow up reminder notice was sent out two weeks after the initial survey delivery (Appendix One, Part 2) and a duplicate copy of the questionnaire was sent to seven hundred and twenty potential respondents who had not returned their questionnaire within one month of the initial delivery.

Of the 1000 questionnaires sent out, 68 were undeliverable because the respondent had changed address or left the company. A further 23 did not make capital investment decisions as they were made by the parent company or head office. Of the remaining 909 questionnaires, 236 (26%) were returned completed. However, not all of the questionnaires had all sections completed, so response rates varied among the sections of the questionnaire.

The second stage of the questionnaire contained the sixteen decision cases of the experimental study. There were 72 respondents who agreed to participate in the second stage of the study. These respondents were asked to complete the sixteen decision cases by indicating the acceptability of the investment decision after the hypothetical conditions of each case were considered. The respondents were also asked to indicate the subjective weight they attached to each of the four social controls, the extent to which they felt confident that decisions they had made were ‘the right ones for their firm’, and the extent to which the decisions would change if they had been given more information.
The initial mailing of the Stage Two survey (covering letter may be found in Appendix One, Part 3) was followed by a reminder letter (Appendix One, Part 4) accompanied by a duplicate copy of the questionnaire. There were 72 Stage Two questionnaires sent out and 42 (58%) were returned fully completed.

The response rates for both sections of the study were in an acceptable range for mail survey questionnaires. However, as not all of the target study population returned completed questionnaires, there remains a possibility of non-response bias in the results. It is possible that those who did not respond are different from those who did respond in a way that is relevant to the study and which would have caused systematic differences in their responses. Thus it might be possible that the non-respondents to the questionnaire were less socially responsible individuals, or less interested in considering environmental aspects of their decision-making. This possibility was discussed by Ross (1991, p.161):

However, it would be a considerable extension to hold out that such a proposition, (currently untested), would in itself, justify altering the general findings reached in this study. Rather it would be best to consider the less-than-perfect response rate and its potential non-response bias as an inherent weakness of this study design.

Dillman (2000, p.197) points out "(t)he four cornerstones of survey precision or accuracy - coverage, sampling, non-response, and measurement - are each a distinct source of error."

He adds that although it is possible to precisely calculate sampling error:

...the amount of sampling error cannot be used independently as an adequate or sole indicator of the precision of the estimates for the entire population. That precision may also be affected by the presence of non-response, measurement, and/or coverage errors. As of yet there is no accepted way of providing a meaningful combined measure of the effect of these four sources of error on overall accuracy.
As Dillman implies, it is not possible to determine adequately the extent of non-response error (or indeed any of the other forms of error noted above). This weakness and others inherent in the two research methods used in this study, can only be addressed, as Ross suggests by further investigations (using a different research method) of the differences between respondents and the effect of these differences on the research question. In this thesis the problem is offset to some extent by the use of a triangulation approach with two different research methods.
Chapter 4

Results and Discussion

4.1 Introduction

This chapter sets out the findings about the influence of selected social controls on the capital investment decision-making of the firm. The research findings are derived from the experiment and the passive observation survey. As these findings are extensive, their relationship to the prior literature is discussed where relevant.

This chapter is set out in the following manner:

◆ Section 4.2 presents the findings of the experiment, which are used to evaluate Research Question 1 about the relative influence of the social controls on the capital investment decision and Hypothesis 1 about the use of configural cue processing in capital investment decision-making.

◆ Section 4.3 begins the presentation of the findings of the passive observation study. Section 4.3.1 introduces the section followed by discussion of the analysis of the passive observation data. The data on the indicators for each of the social controls is presented in sections 4.3.2, 4.3.3, 4.3.4 and 4.3.5. This data is then used to evaluate Hypothesis 2 on industry effects in section 4.3.6 and Hypothesis 3 on firm size effects in section 4.3.7.

◆ Section 4.4 presents the data on the mainstream financial and strategic factors in the capital investment decision.
Section 4.5 investigates Research Question 2. The mean scores for the sets of indicators for each of the four social controls are compared to those for the non-environmental factors. This provides an indication of the relative weighting of the environmental versus the non-environmental factors.

Section 4.6 presents data for the evaluation of Research Question 3 on environmental costs.

4.2 Weighting of the Environmental Social Controls

This section reports the results of the factorial experiment conducted to examine the influence of the environmental social controls (viz., mandatory environmental disclosure; regulation; environmental subsidisation; and stakeholder opinion) on the capital investment decision. In particular, evidence is presented on (1) the weights of the social controls; and (2) the use of configural cue processing in capital investment decision-making. Before proceeding to the discussion of these findings, a discussion of the validity of the research instrument is presented.

4.2.1 Measures of Validity

Two measures of validity were used to assess the respondents' views of the factorial experiment as a measure of the environmental factors investigated. Firstly, for the experiment to be a valid representation of the capital investment decision it is necessary that the information presented to the respondents be sufficient for them to make confident decisions. To determine whether this was the case, the respondents were asked to indicate whether they were confident that their judgement about the environmental factors was "the
right one” for their firm. On a seven point scale (on which 1 = “not very confident” and 7 = “very confident”) the respondents displayed a high level of confidence. Only 4 of the 41 respondents indicated a grade of less than 4. The distribution of responses, which is shown in Figure 4.1, indicates that most respondents were very confident about the correctness of their decisions. This finding suggests that the managers found the experiment to be a sufficiently valid representation of the capital investment decision to enable them to make confident decisions.

Figure 4.1

As a second measure of the validity of the research instrument, the respondents were asked to “indicate the extent you feel your decisions would change if you were presented with additional environmental information”. The respondents were also invited to indicate the nature of the additional information they would require. The distribution of responses on desired change in information is shown in Figure 4.2.

The scale for this measure was the reverse of the previous scale in that a low score indicates a favourable response with 1 = “not very much change” and 7 = “very much
change". A grade of less than 4 was assigned by 40% the respondents while 43% of the respondents assigned a grade of 5 or more indicating that their decisions would change very much. The responses suggest that moderate change would likely be made to the decisions if more environmental information was provided.

*Figure 4.2*

The findings for the two measures of validity suggest respondents were mostly quite confident about their decisions but would like more information. There were 20 responses indicating the nature of the additional information desired. This information was broadly of two types. First, respondents wanted more detail on the costs involved such as greater indication of the extent of cash flow impacts of changes in the variables and the outcome of an environmental impact study. Second, respondents wanted information on the future of the investment, such as the incremental level of environmental improvement achieved by the investment and predictions regarding regulatory changes and technological improvements.
The additional information the managers requested could not be included in the experimental decision cases as it would make them quite complex leading to ambiguities and confusion. This highlights a deficiency of the experimental method, which is the need to constrain the detail provided, so as to avoid giving information which may be interpreted in many different ways by respondents.

To overcome this difficulty, the respondents were asked to recall their last production-related capital investment decision and evaluate the hypothetical environmental information presented in the context of that decision. Although the decision cases were brief, the instructions given for the experiment provided additional information about the decision cases. Pilot test managers who completed the Stage 2 questionnaire were very experienced decision-makers. These managers had no difficulty in completing the decision cases and indicated that they had sufficient information to enable them to make the decision confidently. Therefore the difficulties arising from the brevity of information provided were expected to be minimal.

4.2.2 Social Control Measure Weighting

Evidence drawn from the experiment is used to address Research Question 1:

“What is the relative weight of mandatory environmental disclosure, regulatory costs, environmental subsidies, and stakeholder opinion in the capital investment managers’ assessment of the acceptability of the capital investment proposal?”

32 Similarly the Stage 2 respondents were all very experienced in capital investment decision making (mean of 10.6 years experience) with decisions of $10,000 minimum size.
To answer this question, three measures used to gain evidence are:

1. The self-reported control measure weightings, where each investment manager was asked to allocate 100 points among the four variables;

2. Magnitude of effect measurements where the change in the mean investment judgement brought about by moving from a “better” to a “worse” level of each of the control measures was assessed. This measure was calculated separately for each of the four social controls on each manager’s assessment of the favourableness of the capital investment.

3. The effect size, measured by calculating each social control measure’s main effect and interactions found to be significant in the capital investment decision. Effect size was calculated using eta squared which sets out the proportion of variance explained by each of the factors.

Evidence of the social control measure weighting, derived from these three measures, is presented in Table 4.1 and discussed in the following sections.

4.2.2.1 Self-Reported Weightings

The self-reported weightings are a subjective measure of managers’ perceptions of the weight of each social control. By this measure stakeholder opinion is weighted more heavily than any of the regulatory social controls (regulation, subsidisation and mandatory disclosure) in the capital investment decision. The individual mean ratings derived from this measure indicate that stakeholder opinion, with a weight of 40.6% has a much greater influence than regulation (19.32%). Surprisingly, subsidisation was also more influential than regulation with a weight of 28.34%. Mandatory disclosure had a relatively very low weight of only 11.98%.
Table 4.1
Social Control Measure Weightings

<table>
<thead>
<tr>
<th></th>
<th>Subsidisation</th>
<th>Mandatory Disclosure</th>
<th>Stakeholder Opinion</th>
<th>Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-reported Weights (%)</strong></td>
<td>28.34</td>
<td>11.98</td>
<td>40.60</td>
<td>19.32</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>17.51</td>
<td>8.82</td>
<td>19.61</td>
<td>11.40</td>
</tr>
<tr>
<td><strong>Range (L - H)</strong></td>
<td>5 – 90</td>
<td>0 – 35</td>
<td>0 – 80</td>
<td>0 – 50</td>
</tr>
<tr>
<td><strong>N = 41</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rank Order</strong></td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Magnitude of Effect</strong>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rating: Better</td>
<td>4.1219</td>
<td>3.8292</td>
<td>4.3780</td>
<td>4.0518</td>
</tr>
<tr>
<td>Rating: Worse</td>
<td>2.7835</td>
<td>3.0762</td>
<td>2.5274</td>
<td>2.8537</td>
</tr>
<tr>
<td>Difference</td>
<td>1.3384</td>
<td>0.753</td>
<td>1.8506</td>
<td>1.1987</td>
</tr>
<tr>
<td>% of summed differences (N = 41)</td>
<td><strong>26</strong></td>
<td><strong>15</strong></td>
<td><strong>36</strong></td>
<td><strong>23</strong></td>
</tr>
<tr>
<td><strong>Rank Order</strong></td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Effect Size</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main Effects % (Total = 92)</td>
<td>25.80</td>
<td>9.33</td>
<td>42.40</td>
<td>21.4</td>
</tr>
<tr>
<td>Interactions % (Total = 8)</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>Combined Effect (%)(Total 100, N = 41)</td>
<td><strong>25.86</strong></td>
<td><strong>9.39</strong></td>
<td><strong>42.46</strong></td>
<td><strong>21.46</strong></td>
</tr>
<tr>
<td><strong>Rank Order</strong></td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

*Based on the degree to which the mean judgement changes as the level of the factor changes (Slovic et al, 1973; Ross, 1991, p. 168).

The relatively high standard deviations for stakeholder opinion and subsidisation (19.61 and 17.51 respectively) suggest more variability among the managers on the weighting of
these two variables than the lower weighted variables. In comparison, the standard deviations of 11.4 for regulation and 8.82 for mandatory disclosure indicate a much lower level of variance among the managers about the weights of these two factors.

4.2.2.2 Magnitude of Effect Measurements

Mean changes in the investment managers’ assessments of the overall acceptability of the capital investment proposal were calculated. These changes result from moving from a level of ‘better’ to a level of ‘worse’ for each of the four environmental social controls. The weightings for each variable are derived by taking a percentage of the summed differences. The weights are fairly similar to those for the self-reported weightings.

The magnitude of effect measurements also suggest that stakeholder opinion is the environmental variable which is most influential in the capital investment decision. By this measure stakeholder opinion scored slightly lower (36%) than by the self-reported weightings (subsidiatisation similarly slightly lower at 26%). However, this measure supports the finding that these two variables had the highest weights. Regulation (23%) and mandatory disclosure (15%) were weighted slightly higher by this measure than the self-reported weightings. However, these weightings also support the findings of the self-reported weightings about the ranking order of the variables, with regulation third and mandatory disclosure again the lowest weighted variable.
4.2.2.3 Effect Size Measurements

The effect size measurements of each social control measure’s main effects and interactions support the findings of the previous two measures indicating that stakeholder opinion has the highest weighting (42.46%), followed by subsidisation (25.38%), regulation (21.46%) with mandatory disclosure lowest (9.39%). The combined effect sizes were obtained by allocating the interactions to the main effects for each social control measure. However, the effect sizes for both interactions were similarly very small relative to the main effects and contributed little weight to the combined effect sizes.

The graph in Figure 4.3 indicates that the findings of the three measures used in the Stage 2 study are in agreement regarding the rank order of influence and show fairly similar findings on the weightings of the social controls. This correspondence between the three measures provides reassurance as to the validity of the findings of the experimental study.

Figure 4.3

Weights of the Social Control Measures

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33 Half of each eta squared value for the second order interactions was allocated to the two relevant variables. For example, half of the eta squared value for the regulation-subsidisation interaction was added to the regulation main effect and half to the subsidisation main effect.

34 A problem with interactions is that ambiguities arise because the proportion of influence attributable to each of the primary factors within the interactions is not measured. However, in this instance the ambiguity is of little consequence as the interactions contribute a relatively small weight to the decision.
Conclusion:

These findings from the experiment suggest that (relative to each other) the weights of the four social controls in the capital investment decision are:

- Stakeholder Opinion: range 36 - 43%
- Subsidisation: range 25 - 28%
- Regulation: range 19 – 23%
- Mandatory Disclosure: range 9 – 15%

4.2.3 The Nature of Capital Investment Cue Processing

This section addresses Hypothesis 1:

Capital investment managers process environmental cues configurally when assessing the acceptability of a capital investment proposal.

Configural cue processing means that the pattern of stimuli is important to the decision (Brown and Solomon, 1990). Using this pattern managers simplify the decision process by combining cues. Thus, the value of one investment cue in the capital investment decision depends on the value of another cue. Evidence of the nature of capital investment cue processing by the managers is set out in Table 4.2. This evidence consists of the effect size for each social control main effect and interaction found to be significant (p < .05) as well as its F-value, significance and the power of the test of significance. Interactions found to be significant are an indication of configural cue processing.

Significant interactions were found between (i) regulation and subsidisation; and (ii) stakeholder opinion and disclosure. In the case of the first interaction it appears that respondents are offsetting subsidisation against the costs of regulation, forming a combined
cue which might be termed “net regulatory costs”. In the second case respondents are combining mandatory disclosure with stakeholder opinion, to form a combined cue which might be termed “net effect on stakeholder opinion”. These are both logical combinations which were noted in the discussion in section 3.2.2 as likely interactions. However, both pairs of interactions although significant at the .05 level, account for only a very small part of the decision compared to the main effects.

\textit{Table 4.2}

\textit{Social controls Main Effects and Interactions}

<table>
<thead>
<tr>
<th>Factor</th>
<th>Effect Size #</th>
<th>F-value</th>
<th>Significance</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsidisation (S)</td>
<td>.177</td>
<td>137.227</td>
<td>0.000**</td>
<td>1.00</td>
</tr>
<tr>
<td>Disclosure (D)</td>
<td>.064</td>
<td>43.441</td>
<td>0.000**</td>
<td>1.00</td>
</tr>
<tr>
<td>Regulation (R)</td>
<td>.147</td>
<td>109.975</td>
<td>0.000**</td>
<td>1.00</td>
</tr>
<tr>
<td>Stakeholder Opinion (SO)</td>
<td>.291</td>
<td>262.535</td>
<td>0.000**</td>
<td>1.00</td>
</tr>
<tr>
<td>Interactions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S x R</td>
<td>.007</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MD x SO</td>
<td>.007</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Interactions</td>
<td>.014</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum of Effect Sizes</td>
<td>0.693</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\textit{** Significant at .01  * Significant at .05}

\textit{# Effect size is measured using partial eta-squared.}

The interactions became detectable after about twenty cases were entered on the database. As subsequent cases were added, the effect size for both pairs of interactions fluctuated. Overall, the effect size was not growing larger as subsequent cases were added. Rather, one would increase the effect and the next would cancel it out. This suggests that at least some of the respondents were making decisions by combining these two sets of cues.
The subsidisation/regulation interaction was marginally less subject to this "swing" effect, but the effect size remained consistently small for both interactions. The interactions are illustrated in Figure 4.4.

Figure 4.4

Pareto Chart of the Standardized Effects

(Apex = .05)

The Pareto Chart in Figure 4.4 shows that both the subsidisation/regulation interaction (AD) and the mandatory disclosure/stakeholder opinion interaction (BC) are significant at .05. However, the figure clearly shows that the effect size of these interactions is small relative to those of the main effects.
Conclusions Regarding Research Question 1

Statistically significant interactions were found between subsidisation and regulation and also between mandatory disclosure and stakeholder opinion. Thus the hypothesis that capital investment managers use configural cue processing in making their capital investment decisions is supported. However, despite their statistical significance, the effect sizes for the two pairs of interactions are quite small relative to the main effects. The finding is qualified by noting that it appears that some managers use configural cue processing whilst others do not, and that a much larger proportion of the decision depends on the consideration of individual cues.

A Note on Self-Insight

After completing the decision cases the managers were asked to complete a self-reported weighting, in which they allocated 100 points over the four social controls. This is a subjective measure of the influence of the social controls on capital investment. As well as providing a third measure of the relative weights of the social controls, this test also gives an indication of the level of self-insight managers have about their own decisions.

Ashton (1974) and Slovic et al (1972) found that decision-makers frequently under/over estimate the values of the variables. However, their testing was carried out on university students. Gibbins and Sweiringa (1995, p.245) conducted similar tests on managers and found that, in a professional environment, there is likely to be a greater degree of self-insight since “one is expected to know how one’s choices were made”.

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The level of experience of the managers in this study was high with 90% reporting 5 or more years of experience in capital investment decision-making. If Gibbins and Sweeringa’s view is correct the managers should display a high degree of self-insight. This study’s findings support those of Gibbins and Sweeringa as the mean self-insight scores for the measures were fairly similar to the scores for the effect size, suggesting a high degree of self-insight for most managers. The managers responding to the experimental study were also asked to rate their level of confidence in their decisions. The high level of confidence displayed by the managers is also consistent with the view of Hooper and Trotman (1994) that self-insight is related to decision confidence.

4.3 The Passive Observation Study

This section presents the data from the passive observation (Stage 1) study. This study provides a more detailed investigation of the four social controls than the experiment. Sets of indicators form an index or construct for each social control variable as well for the non-environmental (financial and strategic) factors.

4.3.1 Introduction

This section is set out as follows. First in section 4.3.2 issues pertaining to the analysis and interpretation of the passive observational data are discussed. Next the findings for the social controls are set out in sections 4.3.3 to 4.3.6. These sections present data on regulation, subsidisation, stakeholder opinion and mandatory disclosure.

As the data from this study is quite extensive the following method of presentation has been adopted. Each of the above sections is set out in a similar manner. The mean scores
for the entire respondent group are presented and discussed first, followed by the scores for each of the three industry groups with the largest number of respondents, viz., food, metals and extractive industries. The data from each index not only provides rich description of the capital investment decision but is also used to address a number of research questions and hypotheses.

The data presented in sections 4.3, 4.4, 4.5, and 4.6 is then used to evaluate Hypothesis 2 on industry effects and Hypothesis 3 on size effects. Section 4.3.7 evaluates Hypothesis 2 on the moderating influence of industry type and section 4.3.8 evaluates Hypothesis 3 on the moderating influence of firm size.

4.3.2 Regulation

Government (in the form of regulatory authorities) has been found to be the stakeholder with the most influence on the environmental activities of firms (Tilt, 1997; Baylis, Connell and Flynn, 1998a; b). This section examines various aspects of environmental regulatory influence. The examination of the regulation data is first directed to the results of the analysis of data for the entire sample population in section 4.3.2.1 and the data is then analysed by industry sectors in section 4.3.2.2.

4.3.2.1 Data for the Entire Respondent Population

Overall, the regulatory means cluster around the midpoint (around the 3 to 4 range on the scale of 0 to 7) with similarly high standard deviations. This suggests that regulatory factors are very influential to most managers although there is some variability in their
assessment of influence. The Cronbach’s alpha of .9464 suggests high reliability of the regulatory index as a measure of influence of regulatory costs.

The graph in Figure 4.5 ‘Mean Scores for Regulation Indicators’ suggests that all the indicators are relatively high in influence. Licences and permits and environmental fines and penalties are the most influential factors, followed by hazardous waste disposal. The other indicators were fairly closely clustered around 3.6 to 3.8.

**Figure 4.5**

![Mean Scores for Regulation Indicators](image)

Table 4.3 details the mean responses for regulatory indicators. The table is followed by a discussion of the salient points derived from the data.

1. Licences and permits received the highest score (4.23) while ‘environmental fines and penalties’ scored slightly lower and was the second most influential. However, during the pilot testing, several managers expressed the view that they did not consider environmental fines and penalties to be influential because they always maintain standards at or above compliance level.
However, one manager, whose company had recently been prosecuted by the EPA, disagreed with this view, commenting ruefully: "you don't think it's important until it happens to you. You have to get hit before you realise just how important it is". It may be that many managers do 'realise how important it is' since 'licences and permits' achieved the second highest regulatory influence score. Alternatively, many managers may have been 'hit' (fined) by the EPA. This finding suggests that the cost of ‘licences and permits’ and ‘fines and penalties’ is sufficient to have an impact on capital investment decision-making.

**Table 4.3**

*Descriptive Statistics for Regulation Indicators:*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Rank Order</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Item-Total Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1 Charges for emissions to air/water</td>
<td>9</td>
<td>3.5982</td>
<td>2.4254</td>
<td>.7480</td>
</tr>
<tr>
<td>R2 Hazardous waste treatment or disposal</td>
<td>3</td>
<td>4.0553</td>
<td>2.3663</td>
<td>.7001</td>
</tr>
<tr>
<td>R3 Expectation of future increases in compliance costs</td>
<td>6</td>
<td>3.7574</td>
<td>2.1013</td>
<td>.7587</td>
</tr>
<tr>
<td>R4 External Property Damage</td>
<td>8</td>
<td>3.6213</td>
<td>2.2544</td>
<td>.8305</td>
</tr>
<tr>
<td>R5 Internal property damage</td>
<td>7</td>
<td>3.6638</td>
<td>2.1147</td>
<td>.7980</td>
</tr>
<tr>
<td>R6 Natural resource damage</td>
<td>4</td>
<td>3.8383</td>
<td>2.3533</td>
<td>.8417</td>
</tr>
<tr>
<td>R7 Site restoration/remediation</td>
<td>5</td>
<td>3.7872</td>
<td>2.4226</td>
<td>.7731</td>
</tr>
<tr>
<td>R8 Environmental fines/penalties</td>
<td>2</td>
<td>4.1489</td>
<td>2.3514</td>
<td>.8387</td>
</tr>
<tr>
<td>R9 Licences/permits</td>
<td>1</td>
<td>4.2255</td>
<td>2.2217</td>
<td>.7997</td>
</tr>
<tr>
<td>Total Mean for Index 3.8433</td>
<td></td>
<td></td>
<td></td>
<td>Cronbach Alpha = .9454</td>
</tr>
</tbody>
</table>

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2. 'Hazardous waste treatment or disposal' was third with a score of 4.06. The relatively low influence of 'charges for emissions to air and water' is in striking contrast to this finding, as it was the least influential indicator.

3. Although respondents to the survey represented all states, other states now also apply similar user pays principles. It appears that for most respondents these charges are not overly important in their decision-making. The EPA (NSW) (1998) international fee comparison (discussed in section 2.2.2.3) shows the level of fees for air emissions in NSW to be quite low relative to those of other developed nations. This suggests that the fees are not sufficient to influence many firms to make more costly investments in less polluting plant and equipment. Rather than creating a "trade off" situation where less polluting capital equipment is worth the extra cost to reduce pollution charges, the EPA (NSW) appears to providing "hidden subsidisation" in the form of minimal charges.

A similar situation may exist in relation to 'trade waste' schemes for the disposal of waste through the drainage system. For example, James (1997) commented about the current trade waste disposal scheme in NSW (initiated by Sydney Water in 1988) that no observable reduction in concentration or flows had yet been made. This is consistent with the finding of low influence for 'emissions to air and water' in this study. If the charges are low they can be expected to have little influence on decision-making.

4. Further support for this concern comes from the 'expectation of future increases in compliance costs' indicator. Although EPAs are phasing in increases in pollution charges and other compliance costs, the 'expectation of future increases in
compliance costs' produced a score of 3.76, ranking only sixth. This supports the view that pollution charges may be too low, since many managers are not unduly concerned about future increases in compliance costs. This finding differs from White et al's (1995) USA study in which this factor was of relatively high influence. As noted in section 2.22.1, one of the stated objectives of the NSW load-based licensing scheme is to provide incentives to industry for ongoing improvements in environmental performance and the adoption of cleaner technologies (EPA (NSW), 1998). However, in relation to capital investment, this appears to have had only a low impact.

5. The relatively lower scores for internal and external property damage may also reflect an "it can't happen to us" mentality of some managers, although the high standard deviations indicate some variance in the views of the managers. Site restoration and remediation and various forms of property and natural resource damage all had relatively low scores (in the range of about 3.6 to 3.8). 35

4.3.2.2 Descriptive Statistics for Regulation: Industry Sectors

The data set out in Table 4.4 shows some industry variation in managers' assessments of the influence of the regulatory cost indicators. This variation reflects the differing activities and attitudes of the three sectors. In particular the extractive sector was most influenced by regulation, with a total mean score about one point higher than the metal

35 Bates (2000) considers that clean-up provisions in Australia are subject to the same criticism as CERCLA in the USA and could be very costly for firms Bates is referring to retrospective liability - which means that operators or occupiers and lenders may be liable for the actions of previous owners or occupiers of the property. However, it appears that any concern about clean-up costs has not as yet impacted highly on capital investments.
industries. In contrast, the metal sector scores were mostly the lowest across the three industry sectors.

Table 4.4

<table>
<thead>
<tr>
<th>Item</th>
<th>Metal</th>
<th></th>
<th>Rank Order</th>
<th>Food</th>
<th></th>
<th>Rank Order</th>
<th>Extractive</th>
<th></th>
<th>Rank Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1 Charges for emissions to air/water</td>
<td>2.8036 (2.3310)</td>
<td>9</td>
<td>3.8852 (2.5472)</td>
<td>6</td>
<td>4.3556 (2.0578)</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R2 Hazardous waste treatment or disposal</td>
<td>3.6429 (2.3850)</td>
<td>1</td>
<td>3.9355 (2.6727)</td>
<td>5</td>
<td>4.6364 (1.8193)</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R3 Expectation of future increases in compliance costs</td>
<td>3.3929 (2.0686)</td>
<td>2</td>
<td>3.9355 (2.2093)</td>
<td>4</td>
<td>4.1636 (1.8734)</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R4 External property damage</td>
<td>3.0714 (2.2632)</td>
<td>8</td>
<td>3.7419 (2.3604)</td>
<td>8</td>
<td>4.3091 (1.9039)</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R5 Internal property damage</td>
<td>3.2143 (2.1968)</td>
<td>7</td>
<td>3.9194 (2.1524)</td>
<td>3</td>
<td>4.0182 (1.8408)</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R6 Natural resource damage</td>
<td>3.2500 (2.3452)</td>
<td>6</td>
<td>3.8387 (2.5168)</td>
<td>6</td>
<td>4.6545 (1.7973)</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R7 Site restoration/remediation</td>
<td>3.1250 (2.4500)</td>
<td>4</td>
<td>3.1774 (2.6085)</td>
<td>9</td>
<td>5.1455 (1.5919)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R8 Environmental fines/penalties</td>
<td>3.4107 (2.4329)</td>
<td>4</td>
<td>4.2258 (2.6390)</td>
<td>1</td>
<td>4.8364 (1.7295)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R9 Licences/permits</td>
<td>3.5714 (2.2872)</td>
<td>3</td>
<td>4.1290 (2.4460)</td>
<td>2</td>
<td>5.0182 (1.5574)</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.5 sets out ANOVA tests to detect differences among the industry groups for the regulatory indicators. Significant differences were found between the metals and extractive industries for every indicator. Some significant differences were found between food and extractive, but there were no significant differences between food and metals for any of the regulation indicators.
Table 4.5
Industry Sector Differences

<table>
<thead>
<tr>
<th>Indicator</th>
<th>ANOVAs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Metals/Food</td>
</tr>
<tr>
<td></td>
<td>F</td>
</tr>
<tr>
<td>R1 Charges for emissions to air/water</td>
<td>5.735</td>
</tr>
<tr>
<td>R2 Hazardous waste treatment or disposal</td>
<td>.390</td>
</tr>
<tr>
<td>R3 Expectation of future increases in compliance costs</td>
<td>1.885</td>
</tr>
<tr>
<td>R4 External property damage</td>
<td>2.469</td>
</tr>
<tr>
<td>R5 Internal property damage</td>
<td>3.069</td>
</tr>
<tr>
<td>R6 Natural resource damage</td>
<td>1.717</td>
</tr>
<tr>
<td>R7 Site restoration/ remediation</td>
<td>.013</td>
</tr>
<tr>
<td>R8 Environmental fines/ penalties</td>
<td>3.022</td>
</tr>
<tr>
<td>R9 Licences/permits</td>
<td>1.626</td>
</tr>
</tbody>
</table>

** Significant at .01  * Significant at .05

The following points set out the main similarities and differences between the sectors:

1. Site restoration was very influential for the extractive industries, but of relatively low influence for the food and metal industries. Although the food industries are arguably less likely to produce polluted sites than the extractive industries, many are not environmentally benign. Sugar refiners, dairy, meat, bakery, brewery and oilseed crushers all produce (or use) sufficient pollutant substances to be above the threshold for listing on the National Pollutant Inventory database. The metal industry does not have a high public profile and many firms in this industry supply predominantly to
other firms rather than direct to the consumer. This may in part explain the lower influence scores from this industry.

2. The food industries were most influenced by environmental fines and penalties, and cost of licences and permits. Baylis et al’s (1998b) UK study describes the food industry (p.156) as a “laggard sector” with a “bad record for pollution incidents”. If the situation is similar in Australia, many food industry firms may have been impacted by fines and penalties. Another possible reason is that, as the food sector has a high level of small and medium sized firms, compliance cost may impact more on this sector than other sectors with many larger firms and/or ‘deeper pockets’. Significant differences were detected only between the metals and extractive industry sectors.

3. Metal industry managers viewed ‘hazardous waste treatment or disposal’ as the most influential indicator, yet reported ‘charges for emissions to air/water’ as least influential. For the other two industries, both of these indicators were of moderate influence. This is not surprising and may reflect the differing methods of disposal of waste in the three sectors. Significant differences were detected for these two indicators, only between the metals and extractive industries.

4. Internal and external property damage were ranked low in influence (relative to the other indicators) for all three industries. In particular internal property damage was the lowest scoring indicator for the extractive industries. This may be because extractive activities are inherently damaging to the property and site restoration is a normal part of termination for most projects. Again significant differences were detected only between metal and extractive sectors.
5. More surprisingly, the metal industries managers reported expectation of future increases in compliance costs as relatively high in influence. Concern about future increases in compliance costs seems inconsistent in an industry which had the lowest scores for influence of regulation. On the other hand, extractive industry managers considered future increases in compliance costs to be of relatively low influence. Considering that the extractive industries were the sector most influenced by cost of regulation overall, this also seems surprising. However, a possible explanation for this may be that many extractive operations are relatively short term projects.

4.3.3 Subsidisation

Environmental subsidisation in Australia is mostly limited to depreciation allowances for pollution reduction or avoidance investments. Although an indicator was included to test for the influence of direct environmental subsidies, only the indicator on depreciation for environmental investment was used to gauge the influence of subsidisation.

4.3.3.1 Data for the Entire Respondent Population

The responses to the subsidisation indicators for the entire respondent population are summarised in Table 4.6. The findings for the direct subsidisation indicator must be viewed with caution as only 26 respondents were aware of a direct environmental subsidy received by their firm as compared with 236 respondents for the depreciation indicator.
Table 4.6  
Influence of the Subsidisation Indicators

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Responses</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 Influence of depreciation</td>
<td>236</td>
<td>2.6568</td>
<td>1.6647</td>
</tr>
<tr>
<td>S2b Extent of influence of direct subsidies</td>
<td>26</td>
<td>3.6296</td>
<td>1.6207</td>
</tr>
</tbody>
</table>

For most managers the influence of subsidisation at the current level is moderate to low in comparison with the other social controls. Measured on the basis of the depreciation indicator, the subsidisation variable mean of 2.6 was somewhat low compared with the mean regulation score of 3.84 on the scale of 0 to 7. This finding suggests that subsidisation could be used more effectively.

The direct subsidisation score (although for a small number of respondents) was found to be much higher than the score for depreciation allowances and slightly more influential than regulation. Also, in the experiment where hypothetical levels were used, subsidisation was found to be higher in influence than regulation. This suggests that some attention should be given to the type and levels of subsidisation.

4.3.3.2 Industry Differences in Subsidisation Responses

The highest scores for subsidisation were reported by the extractive sector, followed by the food and metals sectors. As shown in the graph in Figure 4.6 subsidisation is influential for all three industry groups with scores ranging from 2.3 to 3. No significant differences were found between industry sectors for subsidisation (F = 1.365; Sig. .293). The distribution was positively skewed (skewness .596) and platykuritic (kurtosis -.349).
Division into industry sectors results in a small population (n) in each group and so reliance cannot be placed on these findings.

Figure 4.6

The data in Table 4.7 includes responses from all industry sectors. As few respondents indicated awareness of a direct environmental subsidy received by their firms, this deviation from the three-industry study was considered worthwhile. More than half of the respondents aware of a direct subsidy rated its influence as 4 or higher. However, direct subsidisation was reported by this small group of managers as much more influential than the depreciation variable.

Table 4.7
Subsidisation by Industry Group

<table>
<thead>
<tr>
<th>Item</th>
<th>Metal</th>
<th>Paper</th>
<th>Food</th>
<th>Chemical</th>
<th>Petrol</th>
<th>Printing</th>
<th>Extractive</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 Influence of Depreciation</td>
<td>2.3750</td>
<td>2.7</td>
<td>2.4677</td>
<td>3.07</td>
<td>2.91</td>
<td>2.33</td>
<td>3.0000</td>
</tr>
<tr>
<td>(1.3956)</td>
<td></td>
<td></td>
<td>(1.6065)</td>
<td></td>
<td></td>
<td></td>
<td>(1.7743)</td>
</tr>
<tr>
<td>S2a Aware of Subsidy (% of respondents)</td>
<td>7/48</td>
<td>1/9</td>
<td>6/58</td>
<td>4/27</td>
<td>1/7</td>
<td>14.29</td>
<td>5/36</td>
</tr>
<tr>
<td></td>
<td>14.58</td>
<td>11</td>
<td>10.34</td>
<td>14.81</td>
<td>0</td>
<td></td>
<td>16.67</td>
</tr>
<tr>
<td>S2b Extent of Influence of Subsidies</td>
<td>3.571</td>
<td>1</td>
<td>2.5</td>
<td>3.4</td>
<td>2.5</td>
<td></td>
<td>4.857</td>
</tr>
<tr>
<td>(1.134)</td>
<td></td>
<td></td>
<td>(1.73)</td>
<td>(1.949)</td>
<td>(2.12)</td>
<td></td>
<td>(1.464)</td>
</tr>
</tbody>
</table>
The similarities and differences between the industry sectors are set out below:

1. The chemical and extractive sectors were the most influenced by environmental depreciation allowances (mean scores about 3). The influence was somewhat lower for the petrol and paper sectors, while food, printing and metals sectors reported the lowest influence. However, the range of the mean scores was small (2.4 - 3) and there were no significant differences detected between industries.

2. The petrol sector reported no awareness of direct subsidisation. This is unsurprising given the high level of profitability of this industry. Managers from the paper, food and printing sectors reported low influence scores for the direct subsidisation indicator (mean score = 2.5). Metal and chemical sectors reported a higher influence level (mean scores about 3.5), while the extractive sector reported much higher influence (mean score 4.9).

These findings suggest that direct subsidisation has the potential to be more influential than subsidisation through the tax system (at least for small to medium size firms). Although the low n makes the findings unreliable, Lockhart’s (1997) discussion on direct environmental subsidisation in the USA indicates a similar experience there. Although subsidies may be costly, it appears from the evidence of the EPA (NSW) (1998) combined with the finding of low influence for charges for emissions to air and water, that hidden subsidisation might be occurring.

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36 See section 2.2.2.3, Table 2.13 International Fee Comparison and associated comments of the EPA (NSW) which acknowledges that the fees charged do not have regard to likely impacts on human health and the environment.
Selective expenditure on direct subsidisation such as that used in the EPA (South Australia) scheme, could be aimed at small firms which might otherwise be unable to afford less polluting capital investment. This might be a better alternative than the current hidden subsidisation, available to any firm (however wealthy) which chooses to take advantage of a society-pays approach to its use of natural resources. Although further investigation of these subsidies is beyond the scope of the present study, direct subsidisation appears to be an under-used resource and worthy of a follow-up study.

4.3.4 Stakeholder Opinion

The data on stakeholder opinion is set out first for the entire respondent population in section 4.3.4.1. This is followed in section 4.3.4.2 by analysis of the stakeholder opinion data for the three industry groups. The stakeholder opinion index investigates non-government stakeholders. Government was not included in the list of stakeholders because all of the other three variables, namely regulation, subsidisation and mandatory disclosure, are aspects of government's function as a stakeholder.

However, to gain an indication of the relative influence of government as a stakeholder, a comparison has been made, in section 4.3.4.1, of the non-government stakeholders with the government (regulatory) stakeholder using the mean score for the regulatory index.

4.3.4.1 Entire Respondent Population

The capital investment managers' assessments of the stakeholder opinion indicators are summarised in Table 4.8. Each of the indicators elicited a full range of responses (minimum = 0; maximum = 7) with a negative skew and a leptokurtic distribution.
(skewness -.546; kurtosis .186). The internal consistency of the indicators was quite high with all indicators having an item to total correlation above .6. The Cronbach alpha score of .8940 suggests a high reliability of the stakeholder opinion index as a measure of stakeholder influence among capital investment managers.

Table 4.8
Mean Scores for Stakeholder Opinion

<table>
<thead>
<tr>
<th>Variable</th>
<th>Rank Order</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Item/Total Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH1 Investors</td>
<td>3</td>
<td>4.2308</td>
<td>2.3287</td>
<td>.5921</td>
</tr>
<tr>
<td>SH2 Insurance companies</td>
<td>4</td>
<td>3.9786</td>
<td>2.0518</td>
<td>.7001</td>
</tr>
<tr>
<td>SH3 Banks/creditors</td>
<td>5</td>
<td>3.6468</td>
<td>1.9803</td>
<td>.6882</td>
</tr>
<tr>
<td>SH4 Credit rating agencies</td>
<td>9</td>
<td>2.6766</td>
<td>2.0079</td>
<td>.6712</td>
</tr>
<tr>
<td>SH5 Employees</td>
<td>1</td>
<td>4.5106</td>
<td>1.8242</td>
<td>.6795</td>
</tr>
<tr>
<td>SH6 Customers</td>
<td>2</td>
<td>4.4085</td>
<td>2.1312</td>
<td>.6309</td>
</tr>
<tr>
<td>SH7 Suppliers</td>
<td>7</td>
<td>3.3277</td>
<td>1.9279</td>
<td>.7522</td>
</tr>
<tr>
<td>SH8 Competitors</td>
<td>6</td>
<td>3.4979</td>
<td>2.1419</td>
<td>.6535</td>
</tr>
<tr>
<td>SH9 Green pressure groups</td>
<td>8</td>
<td>2.7191</td>
<td>1.9649</td>
<td>.5924</td>
</tr>
<tr>
<td>Total Mean for Index</td>
<td></td>
<td>3.7334 (S.D.1.4768)</td>
<td>Cronbach Alpha</td>
<td>.8964</td>
</tr>
</tbody>
</table>

There is much more variability in the influence scores for the stakeholder indicators than for those of the regulatory or subsidisation indicators. Discussion of the findings for the stakeholder indicators follows:

1. The managers reported employees to be the most influential non-government stakeholders. The relatively low standard deviation for this indicator suggests a fairly high level of agreement by managers about this indicator. This is perhaps not surprising as the managers are themselves employees. Another possible reason for the high reported influence of employees might be safety concerns. For example, old
or technologically outdated equipment and processes may produce pollutants which cause employee health problems. Damage to the health of employees can be extremely costly to the firm.

A further consideration is that 62% of respondents are from proprietary companies and so do not have stock market listing. Additionally, during the pilot testing several chemical sector managers explained that their (small but highly profitable) proprietary companies had no debt. For these firms, banks and investors might be lower in priority than for publicly listed firms or highly capital-intensive firms.

2. One interesting aspect of the capital investment managers’ assessments of stakeholder influence was the relatively high influence of insurance companies, which rated higher in influence than banks and other creditors. This may perhaps reflect an increase in the availability and importance of environmental insurance to firms. Schmidheiny and Zorraquin (1998) report that insurance companies are taking an active advisory role in firms for which they provide insurance. The findings of this study suggest that this may be impacting on capital investments.

3. Green pressure groups were reported to have an influence score of only 2.7 – one point lower than the mean employee score. The relatively small standard deviation for this indicator suggests a high level of agreement among managers. This finding supports that of Tilt’s (1997) study of the influence of stakeholders on the environmental activities of the firm. She found that ‘lobby groups’ were accorded a very low influence in contrast to the more general indicator ‘public opinion’, which had a very high influence. It appears that many managers give little consideration to
this source of reputational damage (or are unwilling to acknowledge that they do) when making capital investment decisions.

4. Credit rating agencies were the least influential of the stakeholder indicators. It may be the case (as is likely with green pressure groups) that credit rating agencies are perceived as lacking in legitimacy, that managers are unwilling to acknowledge their influence, or that managers do not perceive credit rating agencies as having any interest in the environmental performance of firms. Schmidheiny and Zorraquin (1998) note that credit rating agencies are now beginning to include environmental risk as part of their rating. However, if assessment of environmental risk by credit rating agencies has the potential to influence capital investment, it appears not to have ‘arrived’ as a factor in the capital investment ‘equation’ for Australian firms.

Figure 4.7

Stakeholder Influence

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Mean Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investors</td>
<td>4.0</td>
</tr>
<tr>
<td>Insurance</td>
<td>3.9</td>
</tr>
<tr>
<td>Banks/Creditors</td>
<td>3.2</td>
</tr>
<tr>
<td>C. Rating Agencies</td>
<td>4.3</td>
</tr>
<tr>
<td>Employees</td>
<td>4.0</td>
</tr>
<tr>
<td>Customers</td>
<td>3.4</td>
</tr>
<tr>
<td>Suppliers</td>
<td>3.1</td>
</tr>
<tr>
<td>Competitors</td>
<td>3.0</td>
</tr>
<tr>
<td>Green Pt. Groups</td>
<td>4.2</td>
</tr>
</tbody>
</table>
Findings on stakeholder opinion are consistent with Mitchell et al’s (1997) approach to stakeholder theory.\textsuperscript{37} For example, the low influence accorded by the managers’ to green pressure groups and credit rating agencies may stem from perceived lack of legitimacy of these groups. However, it is possible that the power of these groups may increase if their activities escalate or impact more directly on the firm. Thus embarrassment and/or damage to the firm’s reputation may mean legitimacy is replaced by urgency, thus increasing stakeholder salience (and power). However, the extent to which this possible increase in influence might flow through to capital investment is as yet unknown.

Regulators (as measured by the mean score for the regulatory index) were rated by the managers as having somewhat less influence on capital investment than creditors, insurance companies, employees, customers and investors. This is consistent with the findings of the experimental study where regulation was ranked lower than stakeholder opinion. Tilt’s (1997, p.381) survey found “governments or legislators” to be the stakeholder with most influence on the firm’s environmental activities. However the term ‘government’ covers a wide range of functions which influence the firms activities. The graph in Figure 4.7 includes the mean regulatory index score as an indication of the influence of government as a regulator (mean = 3.8433, S.D. = 1.9352).

Although this differs from the findings of Tilt, noted above, her investigation was limited to only the collective term ‘governments or legislators’. Although there are some similarities between the two studies, this study’s more extensive investigation of this variable reveals differences in influence accorded to the various indicators of government

\textsuperscript{37} In their use of “Stakeholder Salience Theory”, Mitchell et al propose that stakeholder power depends on the legitimacy and urgency of the stakeholder’s claim on the company.
regulation. Also Tilt’s investigation was directed at influence on ‘environmental activities’ whereas this study investigates influence on capital investment.

4.3.4.2 Stakeholder Opinion – Industry Group Analysis

The metal and food industries were largely in agreement regarding the assessment of stakeholder influence. The mean influence scores and rankings of the indicators showed only marginal variations. Correspondence with the whole sample was similarly quite high. However, the extractive industry managers’ assessments of stakeholder influence differed from the other sectors, with higher influence scores reported for all indicators. The mean scores for the three industry sectors are presented in Table 4.9

<table>
<thead>
<tr>
<th>Industry Group</th>
<th>Metal Mean (Standard Deviation)</th>
<th>Rank Order</th>
<th>Food Mean (Standard Deviation)</th>
<th>Rank Order</th>
<th>Extractive Mean (Standard Deviation)</th>
<th>Rank Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH1 Investors Investors</td>
<td>3.6250 (2.3321)</td>
<td>3</td>
<td>3.9672 (2.5362)</td>
<td>3</td>
<td>5.0727 (1.8445)</td>
<td>1</td>
</tr>
<tr>
<td>SH2 Insurance companies</td>
<td>3.4107 (2.0161)</td>
<td>4</td>
<td>3.9344 (2.0072)</td>
<td>4</td>
<td>4.7091 (1.7498)</td>
<td>2</td>
</tr>
<tr>
<td>SH3 Banks/creditors</td>
<td>3.0714 (1.1775)</td>
<td>6</td>
<td>3.548 (2.0171)</td>
<td>5</td>
<td>4.8545 (1.4197)</td>
<td>3</td>
</tr>
<tr>
<td>SH4 Credit rating agencies</td>
<td>2.1429 (1.9580)</td>
<td>9</td>
<td>2.4914 (1.9881)</td>
<td>9</td>
<td>3.7818 (1.7815)</td>
<td>7</td>
</tr>
<tr>
<td>SH5 Employees</td>
<td>4.3571 (1.8919)</td>
<td>2</td>
<td>4.5000 (1.7532)</td>
<td>2</td>
<td>4.9091 (1.5667)</td>
<td>5</td>
</tr>
<tr>
<td>SH6 Customers</td>
<td>4.4286 (1.7041)</td>
<td>1</td>
<td>4.3387 (2.2539)</td>
<td>1</td>
<td>4.5273 (2.1761)</td>
<td>4</td>
</tr>
<tr>
<td>SH7 Suppliers</td>
<td>2.9107 (1.7506)</td>
<td>7</td>
<td>3.4355 (1.9031)</td>
<td>6</td>
<td>3.4545 (1.9228)</td>
<td>9</td>
</tr>
<tr>
<td>SH8 Competitors</td>
<td>3.2857 (2.1210)</td>
<td>5</td>
<td>3.4355 (2.2396)</td>
<td>7</td>
<td>4.0182 (2.1125)</td>
<td>6</td>
</tr>
<tr>
<td>SH9 Green pressure groups</td>
<td>2.1786 (1.7174)</td>
<td>8</td>
<td>2.6129 (1.9363)</td>
<td>8</td>
<td>3.5091 (2.0173)</td>
<td>8</td>
</tr>
</tbody>
</table>
Table 4.10 sets out the ANOVA scores for the three industry groups. There were no significant differences between any indicators of stakeholder opinion, for food and metal sectors.

<table>
<thead>
<tr>
<th></th>
<th>ANOVAs</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Metals/Food</td>
<td></td>
<td>Food/Extractive</td>
<td>Metals/Extractive</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
<td>F</td>
<td>Sig.</td>
</tr>
<tr>
<td>SH1 Investors</td>
<td>.574</td>
<td>.450</td>
<td>7.074</td>
<td>.009**</td>
</tr>
<tr>
<td>SH2 Insurance</td>
<td>1.979</td>
<td>.162</td>
<td>4.861</td>
<td>.029*</td>
</tr>
<tr>
<td>SH3 Banks/creditors</td>
<td>.644</td>
<td>.424</td>
<td>21.114</td>
<td>.000**</td>
</tr>
<tr>
<td>SH4 Credit rating agencies</td>
<td>.577</td>
<td>.449</td>
<td>15.084</td>
<td>.000**</td>
</tr>
<tr>
<td>SH5 Employees</td>
<td>.181</td>
<td>.671</td>
<td>1.753</td>
<td>.188</td>
</tr>
<tr>
<td>SH6 Customers</td>
<td>.059</td>
<td>.809</td>
<td>.211</td>
<td>.647</td>
</tr>
<tr>
<td>SH7 Suppliers</td>
<td>2.375</td>
<td>.126</td>
<td>.003</td>
<td>.957</td>
</tr>
<tr>
<td>SH8 Competitors</td>
<td>.139</td>
<td>.710</td>
<td>2.091</td>
<td>.151</td>
</tr>
<tr>
<td>SH9 Green pressure</td>
<td>1.647</td>
<td>.202</td>
<td>6.003</td>
<td>.016*</td>
</tr>
</tbody>
</table>

**significant at .01 * significant at .05

Significant differences found between metal and extractive sectors and food and extractive sectors are discussed in the following points:

1. Investors were highly influential for the extractive industries but less so for food and metals industries. In the capital intensive extractive industries, many projects and firms are likely to rely heavily on funding from shareholders and creditors. Additionally the number of proprietary companies was much lower in the extractive sector (38%) as compared to food (64%) and metals (72%). It is not surprising that
the extractive sector, with a high proportion of publicly listed firms, would report the influence of investors to be high. No significant differences were found between food and metals for this indicator but both were significantly different from the extractive sector.

2. No significant differences were detected between industries for employees, customers, competitors or suppliers and the mean influence scores were fairly similar for all industry sectors. Possibly managers from the three industries have a high level of agreement about these stakeholders. However, food and metals sector managers reported employees and customers to be of higher influence than investors, whereas they were less influential than investors, insurance companies and creditors for extractive industry managers. This suggests that differences in the rank order for the extractive industries stems from the highly capital intensive nature of the extractive industries and consequent high importance of relevant stakeholders, rather than to lack of concern for or importance of employees.

3. The managers in all three sectors were in agreement in viewing green pressure groups as low in influence. During the pilot testing several managers indicated a strong dislike of green pressure groups. It seems that this is a sensitive issue and it is possible that many managers are unwilling to accord a high influence to this group.

4. Although significant differences were detected in food/extractive and metal/extractive comparisons of mean scores, managers of all three industries were consistent in according credit rating agencies very low influence.
5. Banks and other creditors and insurance companies were reported to be highly influential by the extractive sector and moderately high influence by the other two sectors.

4.3.5 Mandatory Disclosure

The data for mandatory disclosure is examined first for the entire respondent population in section 4.3.5.1 and then for the three industry sectors in section 4.3.5.2.

Four forms of mandatory disclosure are investigated in the study. These are:

(i) Disclosure in the Directors’ Report regarding environmental compliance.
(ii) Disclosure of environmental information in the annual financial statements.
(iii) Disclosure regarding pollutant emissions in the National Pollutant Inventory.
(iv) Expected increase in disclosure requirements in the annual financial statements.

4.3.5.1 Data for the Entire Respondent Population

For each of the above forms of disclosure respondents were asked to indicate firstly ‘yes’ or ‘no’ as to whether they were aware of requirements for this form of disclosure. In the second part of the indicator respondents who were aware of the disclosure requirements were asked to rate their extent of knowledge. The percentage of respondents who indicated that they were aware of each disclosure requirement was highest for disclosure in the directors’ report (72%).
This requirement is likely to have the broadest application so this finding is perhaps not surprising. The numbers then declined with financial statement disclosure (56%), ‘expected increase in disclosure requirements’ (43%) and National Pollutant Inventory (40%) as the least known indicator. The mean knowledge reported for all indicators was above 4 except for ‘expected increase in disclosure requirements’ which rated only 3.5. The responses to these first two questions are summarised in Table 4.11.

*Table 4.11*

<table>
<thead>
<tr>
<th>Item</th>
<th>Number of Respondents Aware</th>
<th>D1b Extent of Knowledge Of Requirement Mean</th>
<th>St.Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1a Directors Report</td>
<td>170/236 (72%)</td>
<td>4.305 (N=141)*</td>
<td>1.6900</td>
</tr>
<tr>
<td>D2a Financial Statements</td>
<td>133/236 (56.4%)</td>
<td>4.3820 (N = 110)*</td>
<td>1.5500</td>
</tr>
<tr>
<td>D3a National Pollutant Inventory</td>
<td>94/236 (39.9%)</td>
<td>4.0698 (N = 83)*</td>
<td>1.7272</td>
</tr>
<tr>
<td>D4a Expected increase in financial disclosure requirements</td>
<td>102/229 (43.2%)</td>
<td>3.4833 (N = 93)*</td>
<td>1.5010</td>
</tr>
</tbody>
</table>

* The population (N) is reduced because only respondents who indicated that they were aware of the requirement were asked to give a response.

The final stage for each of the disclosure indicators was to ask those respondents who indicated average or high level of knowledge of the requirement, to give a rating of influence on capital investment decision-making. Two means were calculated from this data. Mean 1 is the mean for the whole respondent group with those who were not aware of the requirement rated as zeros. The capital investment decisions of those respondents who have very low/no awareness of disclosure requirements, would logically not be influenced. Therefore, these respondents were accorded a zero influence rating. Mean 2 is the mean score for part (c) of the indicator
(ie. those respondents with a medium to high awareness of the disclosure requirement).

The two mean scores for part (c) are summarised in Table 4.12.

The data from the above indicators provides greater insight into the relative influence of mandatory disclosure. The scores for the entire respondent group (Mean 1) indicate that relative to the other social controls, mandatory disclosure has a very low influence on capital investment. This is consistent with the findings of the experiment. However, the Mean 2 scores (responses of the managers who reported medium high awareness of the requirements) show a much greater influence. This suggests a need for more education of managers about mandatory disclosure requirements.

It is likely that many of the respondents aware of the requirements are from those firms who must comply with them. Many proprietary companies and small firms ‘fall through the net’ and escape public scrutiny. If the disclosure requirements were applicable to more or all firms their influence could be expected to increase significantly.

39 Managers of public companies and extractive industry firms.
Table 4.12
Mean Scores for the Disclosure Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>N</th>
<th>Mean 1</th>
<th>S.D.</th>
<th>N</th>
<th>Mean 2</th>
<th>S.D.</th>
<th>Item/Total Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1c Directors’ Report</td>
<td>235</td>
<td>1.6992</td>
<td>2.0583</td>
<td>120</td>
<td>3.3417</td>
<td>1.83</td>
<td>.6732</td>
</tr>
<tr>
<td>D2c Financial Statements</td>
<td>235</td>
<td>1.4534</td>
<td>1.9856</td>
<td>102</td>
<td>3.3627</td>
<td>1.56</td>
<td>.7039</td>
</tr>
<tr>
<td>D3c National Pollutant Inventory</td>
<td>235</td>
<td>0.8347</td>
<td>1.5879</td>
<td>65</td>
<td>3.0308</td>
<td>1.35</td>
<td>.5259</td>
</tr>
<tr>
<td>D4c Expected increase in disclosure requirements</td>
<td>235</td>
<td>0.7754</td>
<td>1.5860</td>
<td>54</td>
<td>3.3889</td>
<td>1.24</td>
<td>.5818</td>
</tr>
<tr>
<td>Mean for Index</td>
<td>2</td>
<td>2.7910</td>
<td>1.9352</td>
<td>3</td>
<td>3.2828</td>
<td>1.63</td>
<td>Cronbach Alpha: .8015</td>
</tr>
</tbody>
</table>

Other indications of the influence of mandatory disclosure derived from the data are set out in the following points:

1. Directors’ Report disclosure (regarding compliance with regulatory requirements) was reported by the managers to be the most influential disclosure indicator, although only by a small margin. More than 50% of respondents reported a medium to high level of awareness of this indicator. For these respondents the mean influence was 1.6 points higher than the mean score for the whole respondent group.

2. The influence of financial statement disclosure requirements was the second highest with only a small difference between this and the preceding indicator. A medium to high awareness of this indicator was reported by 43% of the respondents. For this group of respondents the mean influence of this indicator was 1.9 points higher than the mean score for the whole group.
3. The National Pollutant Inventory (NPI) was found to have much less influence than the other disclosure indicators with a Mean 1 score of only 0.83. Additionally only 40% of respondents indicated medium to high levels of awareness of this requirement. For those respondents with medium to high awareness this indicator was only slightly less influential (Mean 2 = 3.03) than the mean score for the previous two indicators.

The NPI is still in the early stages of development and many pollutant substances are not yet included in the inventory. Also the current threshold level which triggers a requirement for disclosure about the pollutant substances is high. More firms can be expected to face disclosure requirements as the program develops and the threshold is lowered.

4. ‘Expected increase in disclosure requirements’ was reported to be the least influential indicator with a Mean 1 score of 0.78. Only 43% of respondents reported medium to high awareness of this indicator but for these respondents it was the most influential indicator with a Mean 2 score of 3.39. However, for the other 57% of respondents it seems that expected increase in disclosure requirements has little or no influence.

A number of studies are consistent with this study’s findings and suggest possible reasons for the low influence of mandatory disclosure:

(a) Wood (1998) found managers interviewed to be in agreement that:
   (i) there had been a decline in demand for annual reports;
(ii) environmental information in aggregated form would not provide meaningful information; and many users did not understand financial information in annual reports.

(b) O’Donovan (1999) found that “a consideration of what users wanted to see had little influence on what environmental information would be disclosed in the annual report”.

(c) Descano (1999) found that many investment professionals lack understanding about how environmental strategies enhance financial performance.

The above concerns may be due at least in part to the voluntary nature of environmental disclosure in Australia. There is as yet little compulsion for managers to make “bad news” disclosures.

Whilst an increase in mandatory disclosure requirements may logically be expected to pressure managers to improve their environmental performance, the experience of the United States gives rise to some doubt that this will be the case. Superfund law and associated disclosure requirements may have very costly consequences for firms who must pay for site restoration. However, White et al’s (1995) study of the effects of Superfund law on capital investment decision-making found that only 32% of respondents considered Superfund in capital environmental project evaluation.

Even if mandatory disclosure requirements are significantly increased, the indications from the research of White et al suggest that the firm’s response (at least in regard to capital investment) may be limited. This evidence is consistent with the finding of this study regarding the low influence of mandatory disclosure.
4.3.5.2 Mandatory Disclosure by Industry Sector

An examination of the data for the three sectors (metals, food and extractive) shows that although the disclosure scores are low for all sectors, the Mean 1 extractive industry score is about 1 point higher than the mean scores for the other sectors. Table 4.13 sets out the mean scores for each industry sector, with two means again calculated for each group.

Table 4.13
Mean Scores for Industry Sectors

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D1c Directors' Report</td>
<td>1.3571(^{236}) (1.8530)</td>
<td>3.3462(^{26}) (1.5548)</td>
<td>1.3710(^{236}) (2.0664)</td>
<td>3.7826(^{23}) (1.5361)</td>
<td>2.6000(^{236}) (2.0512)</td>
<td>3.1778(^{45}) (1.8127)</td>
</tr>
<tr>
<td>D2c Financial Statements</td>
<td>1.2143(^{236}) (1.9326)</td>
<td>3.7778(^{18}) (1.3528)</td>
<td>1.2903(^{236}) (2.0517)</td>
<td>4.0500(^{20}) (1.4681)</td>
<td>2.3273(^{236}) (2.0281)</td>
<td>3.0233(^{43}) (1.7659)</td>
</tr>
<tr>
<td>D3c National Pollutant Inventory</td>
<td>0.6071(^{236}) (1.4101)</td>
<td>3.4000(^{10}) (1.2649)</td>
<td>0.6613(^{236}) (1.4815)</td>
<td>3.1538(^{13}) (1.6251)</td>
<td>1.3636(^{236}) (1.7145)</td>
<td>2.5862(^{29}) (1.5473)</td>
</tr>
<tr>
<td>D4c Expected increase in disclosure requirements</td>
<td>0.5893(^{236}) (1.4242)</td>
<td>3.3000(^{10}) (1.5670)</td>
<td>0.4516(^{236}) (1.2103)</td>
<td>3.1111(^{9}) (1.3642)</td>
<td>1.5091(^{236}) (1.9802)</td>
<td>3.6087(^{23}) (1.3052)</td>
</tr>
</tbody>
</table>

*Number of respondents (N) is given as a superscript number beside each mean

Similarities and differences between the three industry sectors are noted below:

1. The number of extractive sector respondents reporting medium to high awareness of the disclosure requirements is, for all indicators about twice as many as in the food and metals sectors. Table 4.14 shows that significant differences were found between food and extractive sectors and metal and extractive sectors, but not between food and metal sectors, for all four disclosure indicators. This is consistent
with findings from the descriptive statistics, as the Mean 1 scores for each indicator reveal that disclosure has much more influence on the extractive industries than the other two groups. Clearly the impact of mandatory disclosure requirements on the extractive industries is much greater than on the other two sectors. This study’s findings suggest that the additional environmental disclosure requirements for the extractive sector are producing a significant impact on capital investment.

Table 4.14
Differences Between Industry Sectors

<table>
<thead>
<tr>
<th>Indicator</th>
<th>ANOVAs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Metals/Food</td>
</tr>
<tr>
<td></td>
<td>F</td>
</tr>
<tr>
<td>D1c Directors’ Report</td>
<td>.001</td>
</tr>
<tr>
<td>D2c Financial statements</td>
<td>.043</td>
</tr>
<tr>
<td>D3c National Pollutant Inventory</td>
<td>.041</td>
</tr>
<tr>
<td>D4c Expected increase in financial disclosure</td>
<td>.322</td>
</tr>
</tbody>
</table>

* Significant at .05  ** Significant at .01

2. Directors’ Report disclosure requirements for the food and metal industries had similarly low (Mean 1) influence scores of 1.37 and 1.36 respectively. In contrast the extractive industry score was much higher (Mean 1 = 2.6). The level of knowledge of this indicator in the extractive industries was reported by the managers to be to be higher than in the metal and food industries. Significant differences were detected between the food and extractive sectors and between the metals and extractive sector but not between the food and metal sectors. For all three sectors the Mean 2 scores were at or above 3, indicating that those respondents who were aware
of this disclosure requirement mostly considered it to be of medium to high influence.

3. The requirements for financial statement disclosure were of very low influence for most metal sector respondents (Mean 1 score = 1.21). The smaller number of managers who reported medium to high awareness of this indicator, across all three sectors, rated it above 3. Surprisingly, the food sector reported the highest Mean 2 score (4.05), with metals second (3.78) and extractive lowest (3.02). It appears that many extractive industry managers consider qualitative disclosures such as those in the Directors’ Report more influential than quantitative financial disclosures. This view is perhaps reflected in the numerous ‘glossy’ environmental reports appearing in extractive sector annual reports in recent years. Significant differences were detected between the food and extractive sectors and also between metal and extractive sectors. However, no significant differences were found between food and metals sectors for this indicator.

4. The National Pollutant Inventory (NPI) indicator was reported to have low influence by the food and metals sectors (Mean 1 scores of 0.66 and 0.61 respectively). The extractive sector considered the NPI to be of more influence than the other two sectors (Mean 1 score = 1.36). The Mean 2 scores were found to be much higher. Surprisingly, the metal sector had the highest mean (3.4), followed by food (3.16) and extractive lowest (2.59). However, the numbers of respondents in metals and food sectors was low (10 and 13 respectively).
This finding suggests the possibility that the NPI may have potential to be a much more effective social control measure. It is likely that this effect can only be achieved with the lowering of the threshold, coupled with public education about the NPI. Due to the number of respondents reporting awareness of the requirement, \( n \) for Mean 2 is relatively small. It is possible that this small group of respondents are those whose firms are captured by NPI reporting requirements. If this is the case it suggests that the NPI is effective, at least for those firms or managers who must report. However, it must be cautioned that given the small numbers of managers responding, individual differences may have introduced bias and that the respondent group is not representative of the population. Again there were significant differences between the food and extractive sectors and the metals and extractive sectors but not between food and metals.

5. ‘Expected increases in disclosure requirements’ were found to have the lowest influence on the managers of the food (Mean 1 - 0.45) and metals sectors (Mean 1 - 0.59), but was slightly more influential than the NPI for the extractive sector (Mean 1 - 1.5). Respondents could be expected to have some degree of familiarity with the trend towards increased environmental disclosure, with recent increases in disclosure requirements such as the Directors’ Report disclosures. However, if disclosure requirements to date have put little pressure on managers, they may not perceive new disclosure requirements as a threat.

The comparison of the industry sector scores is illustrated in the graph below (Figure 4.18). The pattern established for the other social controls is evident for mandatory disclosure, with extractive scores highest, followed by food, with the metal sector clearly the lowest scorer. Although all the sectors are heavily skewed to the low end, this effect is lessened
in the extractive industry sector. The extractive industry scores range from 0 to 6 (as opposed to a maximum score of 5 for metals and 4 for food) and there are less zero influence scores. The much higher Mean 2 scores for mandatory disclosure suggest that there is a relationship between awareness and influence. Logically, managers who must comply with the reporting requirements are likely to be most highly influenced. The extractive industries’ need to comply with more stringent environmental financial disclosure appears to have impacted capital investment in this sector.

Figure 4.8

4.3.6 Industry Type

Hypothesis 3 proposes that:

Industry sector moderates the manner in which capital investment decision-making is affected by mandatory environmental disclosure, regulatory costs, subsidisation, and stakeholder opinion.
The evaluation of data for the three industry sectors shows that there are significant differences between these sectors. Speculation on reasons for these differences, they are likely to be accentuated by the variance in the level of public attention received by these sectors. The extractive industries are subject to a much higher level of public scrutiny, fuelled by recent environmental catastrophes (such as BHPs involvement in the collapse of a tailings dam at OK Tedi in New Guinea and a cyanide spill at the Aural Goldmine in Romania, involving Australian mining company, Esmeralda) (Sydney Morning Herald, 11/7/ 2000).

The extractive industries may be viewed as highly environmentally sensitive in comparison to the food and metal industries. However, the food industry is likely to be more sensitive than the metal sector as it supplies to the end-user markets where poor environmental performance may lead to customer boycotts. In contrast, the metal industry supplies more to other industries. This suggests that, of the three sectors, the metal industries would be least subject to public scrutiny. This view is consistent with the comparison of these sectors in the foregoing sections, since metal industry managers consistently reported the lowest levels of influence. The sensitivity of the extractive sector and the level of public scrutiny is further accentuated by the high proportion of public companies in the extractive sector, relative to the other two sectors (extractive 62%, food 36%, metals 28%).

In a series of ANOVAs the mean indicator score for each of the social controls was regressed on industry sectors. These findings were set out for each of the above variables in the foregoing sections.
The differences for the metals/extractive and food/extractive are shown in Table 4.15.\textsuperscript{40}

Significant differences detected were as follows:

1. \textit{Mandatory Disclosure}: Significant differences in the mean response were found for the mandatory disclosure variable, for all four indicators and for the disclosure index. Significant differences were detected for all indicators in both the food/extractive and metals/extractive comparisons.

2. \textit{Regulation}: Significant differences were found for all regulation indicators and for the regulation index in the metals/extractive comparison. Differences between food and extractive sectors were detected for ‘natural resource damage,’ ‘site restoration and remediation’ and ‘licences and permits’.

3. \textit{Stakeholder Opinion}: In both the food/extractive and metals/extractive comparisons, significant differences were detected for investors, insurance companies, banks, credit rating agencies and green pressure groups. These differences are likely to be a function of (i) differing public perceptions about these industries, (ii) whether the company is publicly listed (which increases public scrutiny) and (iii) the extent of its need for borrowing.

The data for industry sectors shows that three industries were very consistent in their levels of sensitivity to indicators of all the social controls. The extractive industries’ scores were

\textsuperscript{40} As no significant differences were detected for the subsidisation variables and between food and metal sectors, these have not been included in the table. The absence of statistically significant differences in the subsidisation responses may be indicative of more universal appeal of subsidisation as a social control measure. That is, capital investment managers from all industry sectors respond well to subsidisation incentives.
consistently about one point higher on the influence scale than the scores of the food or metals industries for all social controls. This suggests that the extractive sector managers are more sensitive to the influence of environmental social controls in their capital investment decision-making.

Food sector managers were somewhat more influenced by the social controls than metal sector managers, but less than extractive sector managers. Metal sector managers were the least influenced by the social controls. The reasons for this finding are as yet uncertain but are likely to include the following considerations:

(i) **Bad publicity and increased stakeholder pressure caused by recent catastrophic environmental incidents involving mining companies.**

(ii) **The extractive industries have a higher level of environmental disclosure requirements than other industries.**

(iii) **The metal industries are predominantly suppliers to other industries and so do not attract a high level of public attention.**

(iv) **The food industries have a somewhat heightened environmental sensitivity because they supply predominantly to end-user markets and so poor environmental performance may result in customer boycotts.**
Table 4.15
Differences Between Industry Sectors

<table>
<thead>
<tr>
<th>Indicator</th>
<th>ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Metals/Extractive</td>
</tr>
<tr>
<td></td>
<td>F</td>
</tr>
<tr>
<td>D1c Directors’ Report</td>
<td>11.229</td>
</tr>
<tr>
<td>D2c Financial statements</td>
<td>8.763</td>
</tr>
<tr>
<td>D3c National Pollutant Inventory</td>
<td>6.456</td>
</tr>
<tr>
<td>D4c Expected increase in financial disclosure requirements</td>
<td>7.915</td>
</tr>
<tr>
<td>Score for Index - Mandatory Disclosure</td>
<td>12.919</td>
</tr>
<tr>
<td>SH1 Investors</td>
<td>7.074</td>
</tr>
<tr>
<td>SH2 Insurance companies</td>
<td>4.861</td>
</tr>
<tr>
<td>SH3 Banks/creditors</td>
<td>21.114</td>
</tr>
<tr>
<td>SH4 Credit rating agencies</td>
<td>15.084</td>
</tr>
<tr>
<td>SH9 Green pressure groups</td>
<td>6.003</td>
</tr>
<tr>
<td>Score for Index - Stakeholder Opinion</td>
<td>8.001</td>
</tr>
<tr>
<td>R1 Charges for emissions to air/water</td>
<td>1.041</td>
</tr>
<tr>
<td>R2 Hazardous waste treatment or disposal</td>
<td>2.679</td>
</tr>
<tr>
<td>R3 Expectation of future increases in compliance costs</td>
<td>.358</td>
</tr>
<tr>
<td>R4 External property damage</td>
<td>2.013</td>
</tr>
<tr>
<td>R5 Internal property damage</td>
<td>.070</td>
</tr>
<tr>
<td>R6 Natural resource damage</td>
<td>3.978</td>
</tr>
<tr>
<td>R7 Site restoration/remediation</td>
<td>23.523</td>
</tr>
<tr>
<td>R8 Environmental fines/penalties</td>
<td>2.131</td>
</tr>
<tr>
<td>R9 Licences/permits</td>
<td>5.343</td>
</tr>
<tr>
<td>Score for Index – Regulation</td>
<td>4.568</td>
</tr>
</tbody>
</table>

** Significant at .01 * Significant at .05
Conclusion

The evidence supports the hypothesis that industry sector moderates the manner in which capital investment decision-making is influenced by mandatory disclosure, regulation and stakeholder opinion. However, the evidence does not support the hypothesis that industry sector moderates the influence of subsidisation on capital investment decision-making. As limited use is made of environmental subsidisation relative to the other social controls, the possibility for testing this variable was correspondingly limited.

4.3.7 Firm Size

In this section the evidence pertaining to Hypothesis 2 is set out:

H2 Firm size moderates the manner in which capital investment decision-making is influenced by mandatory environmental disclosure, regulatory costs, subsidisation and stakeholder opinion.

The two indicators of firm size included in the passive observation survey are number of full time employees (E) and annual sales (S). Correlation between the two indicators, using Pearson Correlation, was found to be significant at the .01 level, with a correlation of .724. This degree of correlation was judged to be sufficient to enable a combined score called the ‘firm size ratio’ (FSR) to be employed. Means were first calculated for ‘number of employees’ (me) and ‘sales’ (ms) from the data for all respondent firms. Two ratios ‘employee number: mean employee number’ and ‘annual sales : mean annual sales’ were then summed to produce a ‘firm size ratio’ for each firm. The relationship between these measures is set out in the following equation:
Firm Size Ratio = \frac{\text{employee number}}{\text{mean employee number}} + \frac{\text{annual sales}}{\text{mean annual sales}}

FSR = \frac{E}{ME} + \frac{S}{MS}

The total index scores for each set of indicators were regressed on firm size, using data for the entire respondent group. The testing was then repeated using data for the total index scores for each of the three main industry groups used in the industry sector study. The findings were quite limited with no significance found for most of the tests. Only the subsidisation (depreciation) index score showed significant size effects, however these were relatively weak. When the data was subdivided into industry sectors only the regulation index score for the food industry showed significant size effects. These findings are set out in Table 4.16.

*Table 4.16
Total Index Scores Regressed on Firm Size*

<table>
<thead>
<tr>
<th>Mean Score for Index</th>
<th>Beta Coefficient</th>
<th>R- square</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsidisation</td>
<td>.094</td>
<td>.033</td>
<td>1.25</td>
<td>.033*</td>
</tr>
<tr>
<td>Regulation (Food Sector)</td>
<td>.203</td>
<td>.041</td>
<td>2.27</td>
<td>.028*</td>
</tr>
</tbody>
</table>

* sig. at .05

Although these size effects were statistically significant, the relatively low coefficient and associated R square for the subsidisation indicator, indicate that size is a relatively weak influence on the perceived importance of depreciation based subsidy on the capital investment decision. A much stronger influence rating was given by the limited number of small firms which indicated that they received a direct subsidy. The finding of weak influence in perceived importance of subsidies is consistent with depreciation based subsidies lower benefit to the many managers of small firms among the respondents.
The food sector regulation index also showed significant size effects and with a coefficient and associated r square of greater magnitude than for subsidisation, indicating that for the food sector size is a more important influence on the perceived importance of regulation. This is consistent with smaller firms being less subject to regulatory pressure than larger firms.

Size effects were expected to be most likely to emerge where other common factors which accentuated responses in small or large firms would be concentrated (such as industry groups).\(^{41}\) However the data do not support this expectation. A possible reason for the limited detection of size effects is that partitioning of data in this process reduced the number of respondents within each group significantly, making detection of size effects less likely.

Evidence from the literature indicates that large firms are more environmentally conscious than small or medium firms (Ahmed, Montagno and Firenze, 1998) and better environmental performers (Hossain, Tan and Adams, 1994; Trotman and Bradley 1981, and Zhuang and Synodinos, 1997). However, many authors (Gray, Khouhy and Lavers, 1995; Hackston and Milne, 1996; Bujaki and Richardson, 1997; and Baylis et al, 1998b) agree that size alone may not be a sufficient indicator.

\(^{41}\) Mandatory disclosure is arguably the most likely social control measure to be to be influenced by firm size, since accounting standards are more stringent for listed companies (which are generally large firms). However, no size effects were detected for mandatory disclosure. Speculating on the reason for this, a likely explanation is that mandatory disclosure has low influence for all firms whether large or small.
Conclusion

The finding of size effects was limited and patchy and no clear pattern emerged. However, since the relationship between size and subsidisation, and size and regulation variables was significant for the overall index and for a number of variables, the hypothesis that firm size moderates the influence of the social controls has some support.

4.4 Mainstream Financial and Strategic Factors

This section reports the results of the passive observational analysis of the relative influence of mainstream financial and strategic factors. All of these indicators were found to be of high influence. The mean scores for the mainstream financial and strategic factors clustered in the 5 to 6 range. Each of these indicators elicited a full range of responses (minimum = 0, maximum = 7), as did the combined index for financial and strategic influence. Additional statistical measures of the financial and strategic influence index show that it is a leptokurtic distribution (kurtosis = 3.760) and has a significantly negative skew (skewness = -1.708).

A high level of reliability of the index is indicated by the Cronbach’s alpha of .9270, with each individual indicator having an item-total correlation greater than .66. As noted in section 2.8.3 in accordance with the views of Butler et al (1991), the first five indicators are viewed as strategic factors with the remainder being financial factors. However, it must be kept in mind that the strategic factors included in the index are likely to have a strong bearing on the ultimate financial outcome. The results of the data analysis are summarised in Table 4.17, accompanied by a discussion of the salient points emerging from the data on the financial and strategic indicators.
1. Compared to the environmental variables the mean scores for the financial and strategic factors were much higher. The standard deviations for the non-environmental indicators were in the main also lower. Clearly most managers consider these factors to be significantly more influential than the environmental factors.

2. The capital investment managers considered the most influential indicator to be a strategic factor 'fit of project with business strategy' which scored 5.73. This finding was not surprising as it corresponds with that of Butler et al's (1993) experimental study. Additionally, ensuring that the project is consistent with the firm's business strategy seems a logical first step in making the investment decision.

3. 'Effect on productivity' and 'Effect on profit and sales targets' were also found to be very influential. Although these are both viewed as strategic factors, they are likely to have a significant impact on profitability. It is no surprise that factors pertaining to profitability are highly influential.
<table>
<thead>
<tr>
<th>Indicator</th>
<th>N</th>
<th>Rank Order</th>
<th>Mean (S.D.)</th>
<th>Item-Total Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 Fit of project with business strategy</td>
<td>234</td>
<td>1</td>
<td>5.7281 (1.5582)</td>
<td>.7263</td>
</tr>
<tr>
<td>F2 Growth of market related to project</td>
<td>236</td>
<td>8</td>
<td>5.1491 (1.9700)</td>
<td>.6969</td>
</tr>
<tr>
<td>F3 Competitive position of company/unit vis-à-vis external</td>
<td>235</td>
<td>7</td>
<td>5.2632 (1.9101)</td>
<td>.7265</td>
</tr>
<tr>
<td>F4 Effect on product quality</td>
<td>236</td>
<td>5</td>
<td>5.3202 (1.8839)</td>
<td>.6335</td>
</tr>
<tr>
<td>F5 Effect on productivity</td>
<td>235</td>
<td>2</td>
<td>5.7149 (1.4579)</td>
<td>.7710</td>
</tr>
<tr>
<td>F6 Effect on achievement of profit and sales targets for the project</td>
<td>235</td>
<td>3</td>
<td>5.5771 (1.6873)</td>
<td>.7521</td>
</tr>
<tr>
<td>F7 Internal rate of return for the project</td>
<td>236</td>
<td>4</td>
<td>5.3596 (1.7084)</td>
<td>.7844</td>
</tr>
<tr>
<td>F8 Return on assets for project</td>
<td>234</td>
<td>6</td>
<td>5.3070 (1.6560)</td>
<td>.7783</td>
</tr>
<tr>
<td>F9 Net present value for the project</td>
<td>236</td>
<td>9</td>
<td>5.1145 (1.7862)</td>
<td>.6985</td>
</tr>
<tr>
<td>F10 Payback period for the project</td>
<td>236</td>
<td>10</td>
<td>5.1140 (1.8715)</td>
<td>.6662</td>
</tr>
<tr>
<td>Financial Score (grand mean)</td>
<td></td>
<td></td>
<td>5.2669 (1.4023)</td>
<td>Cronbach Alpha .9270</td>
</tr>
</tbody>
</table>

4. **Internal rate of return (IRR)** was the most influential of the quantitative financial measures and was found to be fourth in influence. It was the only quantitative measure included in the top five indicators. Although net present value (NPV) is regarded as being technically superior (Gitman et al, 2000) IRR has been found in a number of studies to be preferred by managers (see Kester et al, 1999).

Although most managers indicated a payback period commonly used (these are set out in the following section), payback period was reported by many managers to be the least influential indicator. This is consistent with the findings of Kester et al (1999, p.32) who found that executives "consider DCF techniques such as NPV and
IRR to be more important than non-DCF techniques for evaluating and ranking capital investment projects”.

The graph in Figure 4.9 shows that in the intra-indicator comparison of the financial and strategic factors all the indicators are very influential but ‘Fit with strategy’, ‘Effect on productivity’ and ‘Effect on profit and sales targets’ can be seen as the most influential. Surprisingly, NPV emerges as only marginally more influential than payback period.

*Figure 4.9*

![Graph showing main financial and strategic factors](image)

This finding is similar to the findings of Butler et al (1993). However, Butler et al found degree of corporate fit, effect on product quality, level of agreement/opposition to the project, effect on productivity, growth of related market and contribution to corporate image, were all more important than the financial factors. The managers demonstrated agreement with the comment of Carr and Tomkins (1996, p.200) who noted that “strategic analysis logically precedes capital budgeting techniques” since “no financial director would want to accept cash flow projections not predicated on sound business logic”.

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Butler et al. (p.71) note that managers seem to place more importance on these strategic factors than numerical financial measures:

Managers prefer to dwell on disaggregated data (data on the market, quality, productivity and corporate image, and so on) than on the financial aggregate in the form of IRR or Payback.

Also in agreement with Butler et al’s findings, the financial indicators were clearly less influential. ‘Internal rate of return’ (IRR) had a mean score of 5.36, followed by ‘Return on assets’ at 5.31. The least influential indicators were ‘Net present value’ (NPV) (5.1145) and ‘Payback period’ (5.1140). Although NPV is regarded as technically superior (Gitman et al, 1998, p.366; Bishop, Crapp, Faff and Twite, 2000, p.224), this study’s findings are consistent with research findings and texts which indicate that IRR is preferred by many managers (Kester et al, 1999, Hansen and Mowen, 1997, p.510). Gitman et al (1998, p.367) suggest a reason for this finding:

The attractiveness of IRR is attributable to the general disposition of managers towards rates of return rather than actual dollar returns when evaluating different activities. Because interest rates, profitability and so on, are most often expressed as annual rates of return, the use of IRR makes sense to financial decision-makers. They tend to find NPV more difficult to use because it does not really measure the benefits relative to the amounts invested.

As Butler et al point out, there is a link between the strategic factors and ultimate performance.

4.5 Influence of Environmental Factors Relative to Mainstream Financial and Strategic Factors

In this section the evidence pertaining to Research Question 2 is set out.

RQ2: “How does the influence of the environmental factors compare with that of mainstream financial and strategic factors in the capital investment decision?
Although data from the experiment in Stage 2 provides strong evidence as to the relative weight of the four social controls, it does not indicate the overall weight of environmental factors in the capital investment decision. A concern regarding the weighting of the environmental variables is the possibility that collectively these environmental factors might account for only a very small proportion of the capital investment decision. However, the experimental weightings cannot be considered comparable with the mean influence scores for the mainstream financial and strategic factors. Therefore, to gain some indication of the relative importance of the environmental factors, the mean influence scores for the attributes of the social control measures were compared with those for the mainstream financial and strategic factors. The results of this comparison are set out in Table 4.18.

The environmental variable mean scores (drawn from the stage 1 survey) range from 1.19 to 3.95, with an overall mean of 2.79. This indicates that the environmental variables have low influence relative to the mainstream financial and strategic factors, which are clustered in the 5 to 6 range (see Figure 4.6). On the scale of 0 to 7 used in the survey, the total mean influence score indicates a perceived influence of 2.79 for environmental factors, compared to 5.36 for mainstream financial and strategic factors.
Table 4.18
Comparison of Influence Scores: Environmental and Mainstream
Financial and Strategic Factors

<table>
<thead>
<tr>
<th>Factors</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Subsidisation</td>
<td>2.6568</td>
<td>1.6647</td>
</tr>
<tr>
<td>Mandatory Disclosure</td>
<td>1.1907</td>
<td>1.4270</td>
</tr>
<tr>
<td>Regulation</td>
<td>3.8433</td>
<td>1.9352</td>
</tr>
<tr>
<td>Stakeholder Opinion</td>
<td>3.6695</td>
<td>1.5117</td>
</tr>
<tr>
<td><strong>Mean Environmental Score</strong></td>
<td>2.7912</td>
<td>1.9352</td>
</tr>
<tr>
<td>Financial and Strategic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F1 Fit of project with business strategy</td>
<td>5.7281</td>
<td>1.5582</td>
</tr>
<tr>
<td>F2 Growth of market related to project</td>
<td>5.1491</td>
<td>1.9700</td>
</tr>
<tr>
<td>F3 Competitive position of company/unit vis-à-vis external competition</td>
<td>5.2632</td>
<td>1.9101</td>
</tr>
<tr>
<td>F4 Effect on product quality</td>
<td>5.3202</td>
<td>1.8839</td>
</tr>
<tr>
<td>F5 Effect on productivity</td>
<td>5.7149</td>
<td>1.4579</td>
</tr>
<tr>
<td>F6 Effect on achievement of profit and sales targets for the project</td>
<td>5.5771</td>
<td>1.6873</td>
</tr>
<tr>
<td>F7 Internal rate of return for the project</td>
<td>5.3596</td>
<td>1.7084</td>
</tr>
<tr>
<td>F8 Return on assets for project</td>
<td>5.3070</td>
<td>1.6560</td>
</tr>
<tr>
<td>F9 Net present value for the project</td>
<td>5.1145</td>
<td>1.7862</td>
</tr>
<tr>
<td>F10 Payback period for the project</td>
<td>5.1140</td>
<td>1.8715</td>
</tr>
<tr>
<td><strong>Mean Financial and Strategic Score</strong></td>
<td>5.3681</td>
<td>1.3631</td>
</tr>
</tbody>
</table>
All the indicators for the financial and strategic factors had means within the range of 5.0 to 5.8. The standard deviations for the environmental indicators were mostly slightly larger than those for the financial and strategic indicators. This indicates a higher level of disagreement among the managers in the assessment of the environmental indicators. As shown in Table 4.18, the range of means for the environmental factors was much more widespread.

Although this provides only a broad indication of the magnitude of influence of the environmental variables, it adds perspective to the view of the relative influence of the environmental social controls. It also provides some reassurance as to the collective influence of the environmental factors measured in the experiment. The mainstream financial and strategic factors are clearly more influential than the environmental factors, which had mean relative influence scores in the range 2½ to 4 as compared to 4 to 5 for the mainstream factors. This finding is consistent with Arlow and Gannon’s (1982) comment that “economic and financial goals dominate goals related to social responsibility”.

Although firms may have become more environmentally aware, for many firms this increased awareness does not yet translate into action in terms of more pro-environmental capital investment.

**Conclusion**

The relative influence of the environmental social controls in the capital investment decision has been found to be much less than the mainstream financial and strategic factors.
4.6 Cost Factors

This section addresses Research Question 3.

RQ3: Which environmental costs have most influence on the decisions of Australian capital investment managers?

Evidence is set out below about the influence of the 15 environmental cost indicators suggested by the literature as those factors most considered by managers. The evidence set out below indicates that these factors do have some influence on capital investment decision making. The managers were presented with a set of 15 indicators of environmental cost, and asked to indicate the influence of each indicator on their investment decisions. The results for the whole survey population are set out in Table 4.19. This is followed by a discussion of the data for the three industry sectors.

Mean scores for environmental costs ranged from 2.367 to 4.4468 on the scale of 0 to 7. All indicators elicited a full range of responses, and the relatively high standard deviations for most indicators suggest that not all managers were in agreement on the influence of these factors. The distribution for the index was negatively skewed (skewness = -.536) with a flattened shape (kurtosis = -.414). The variability in the influence of the 15 indicators of cost is illustrated by the graph in Figure 4.10.
<table>
<thead>
<tr>
<th>Indicator</th>
<th>Rank</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Item-Total Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1. Environmental research costs</td>
<td>15</td>
<td>234</td>
<td>2.8376</td>
<td>2.1146</td>
<td>.7909</td>
</tr>
<tr>
<td>C2. Environmental design costs</td>
<td>12</td>
<td>235</td>
<td>2.9574</td>
<td>2.1078</td>
<td>.7678</td>
</tr>
<tr>
<td>C3. Energy costs</td>
<td>1</td>
<td>235</td>
<td>4.4468</td>
<td>1.9894</td>
<td>.6389</td>
</tr>
<tr>
<td>C4. Cost of environmental training of employees</td>
<td>14</td>
<td>234</td>
<td>2.7830</td>
<td>1.7638</td>
<td>.7117</td>
</tr>
<tr>
<td>C5. Air/waste water/hazardous waste monitoring</td>
<td>8</td>
<td>235</td>
<td>3.4936</td>
<td>2.1190</td>
<td>.7730</td>
</tr>
<tr>
<td>C6. Air/waste water/hazardous waste disposal</td>
<td>2</td>
<td>235</td>
<td>3.9060</td>
<td>2.1509</td>
<td>.8054</td>
</tr>
<tr>
<td>C7. Waste reuse</td>
<td>6</td>
<td>235</td>
<td>3.5872</td>
<td>2.1946</td>
<td>.7431</td>
</tr>
<tr>
<td>C8. Waste recycling</td>
<td>4</td>
<td>235</td>
<td>3.7064</td>
<td>2.2060</td>
<td>.7451</td>
</tr>
<tr>
<td>C10. Off-site hazardous waste transport</td>
<td>12</td>
<td>235</td>
<td>2.9574</td>
<td>2.3566</td>
<td>.7248</td>
</tr>
<tr>
<td>C11. Water costs</td>
<td>7</td>
<td>235</td>
<td>3.5702</td>
<td>2.1835</td>
<td>.6739</td>
</tr>
<tr>
<td>C12. On-site hazardous waste storage and handling</td>
<td>5</td>
<td>235</td>
<td>3.6766</td>
<td>2.3438</td>
<td>.7024</td>
</tr>
<tr>
<td>C13. On-site air emission controls</td>
<td>3</td>
<td>234</td>
<td>3.7393</td>
<td>2.3866</td>
<td>.7912</td>
</tr>
<tr>
<td>C14. Reporting to government agencies</td>
<td>9</td>
<td>234</td>
<td>3.3675</td>
<td>2.1635</td>
<td>.6714</td>
</tr>
<tr>
<td>C15. Sales of environmentally friendly/green products</td>
<td>11</td>
<td>233</td>
<td>3.0901</td>
<td>2.2810</td>
<td>.4988</td>
</tr>
</tbody>
</table>
The most notable factors associated with the environmental cost index are:

(i) Energy costs (mean 4.45) were clearly the most influential factor. The relatively low standard deviation suggests many of the managers were in agreement about the high influence of this factor. The high influence of this factor suggests it should be given priority by regulators in development of environmental social controls. Installation of clean, cost efficient energy sources such as solar and wind power by many firms would significantly reduce greenhouse gases. Given that respondents in this study appear responsive to subsidisation, its use (possibly in the initial stages and phased out later) could be a means of promoting faster introduction of cleaner renewable energy sources, such as solar and wind power.

(ii) ‘Air/waste water /hazardous waste disposal’ was also very influential, ranking second. As the ‘Emissions to air and water’ indicator was of very low influence in the regulation indicators, it is likely that the high influence rating here is due to hazardous waste disposal. The ‘On-site hazardous waste storage and handling’ costs were reported by the managers to be more influential than the off-site cost factors. This might be due to the health and safety aspects of on-site storage and also possibility of migration of hazardous waste off the site.

On site storage can be very costly both in terms of clean-up costs and legal/compensation costs and damage to reputation if waste is not stored in adequate facilities. Whilst cost of transport and treatment or disposal off-site is very costly, the responsibility for the disposal of the waste, once removed form the site, may be transferred to a disposal company. This may make off-site costs potentially less than on-site costs, in terms of liability and damage to reputation.
(iii) Related to the above discussion, the influence of recycling and reuse of waste was found to have about the same influence as on-site hazardous waste storage and handling. This suggests that firms are becoming more aware of the cost saving and benefits to reputation to be gained by recycling and reuse as an alternative to costly disposal of waste.

(iv) Water costs (mean 3.6) were low relative to energy costs (mean 4.5). The regulatory indicator ‘emissions to air and water’ had a mean of 3.6 which was relatively low. It is a concern that cost of water use and emissions to water have such low influence on the firm’s capital investment. If it is less costly to pay for disposal into water/air than to pay for less polluting capital equipment, then the community is subsidising pollution production.

(v) Environmental research and design costs were relatively low in influence. The reason for this low influence is not known. However, it seems unlikely that research costs are low - perhaps a more likely explanation is that many firms do little
or no research related to environmental improvement. This may be an area which would benefit from subsidisation.

(vi) Environmental training of employees was found to have very low influence on capital investment. This may be because managers do not make a connection between capital investment and the need for training. Alternatively it could be because their firms spend very little on environmental training. If either of these alternatives is correct it is cause for concern and suggests the need for further investigation. Many environmental catastrophes have been associated with poorly trained or inexperienced staff (for example Union Carbide's explosion in Bhopal). Capital investment in new technology could be of greater benefit if accompanied by training of employees to make the most effective use of the equipment.

(vii) White et al's (1995) study of environmental costing in the USA (discussed in section 3.7.2) indicates that costs considered most frequently are the "front-line waste management costs". High on the list are energy, water, on-site waste treatment costs and licensing/permitting. The empirical work of this thesis investigates 'influence' of these costs (however, they must be considered if they are to have influence) in relation to capital investment. White et al's study thus provided some guidance as to which costs are likely to be influential. This guidance proved to be fairly accurate as the results of the two studies were quite similar with more obvious costs such as energy being more influential.
Conclusion

Environmental costs which are most influential are energy costs, waste disposal and recycling costs. Whilst it is encouraging to note that firms have become more aware of the importance of waste reuse and recycling, a concern emerges from these findings about the low influence of research and development costs and costs of environmental training. Environmental training was found by White et al.'s (1995) US study to be considered by 59% of respondents. The findings of this study suggest that it receives much less attention from Australian managers. Given that research and design is generally costly, the lack of influence of these indicators may be an indication that spending in these areas is low. This suggests a need for subsidisation to provide more incentives for research and development of improved environmental technology.
Chapter 5
Discussion and Conclusions

5.1 Introduction and Chapter Overview

In this chapter the research is discussed in terms of the objectives of the study set out in section 1.5.1. The principle objective of the study is to investigate the relationships set out in the model presented in section 1.5. These relationships were investigated through the research questions and hypotheses. The results presented in Chapter 4 were accompanied by an examination of the findings and their relationship to the literature. In section 5.2 the examination of the findings of the two studies, viz., the experiment and the passive observation study, are drawn together and examined in the light of differences in methodology. The differences in the two approaches allow for 'triangulation' (that is they permit us to look at the situation from two different perspectives). This is followed by a discussion of the theoretical implications of the findings of this study, in section 5.3. In section 5.4 an overview of the three industries used in the study is set out. In the previous chapter the findings on the three industries were presented in terms of their differences in response to the social controls. In this section these findings are drawn together to provide a description of each industry sector. In section 5.5 the limitations of the research are set out in terms of its scope and design. Possible new research directions suggested by this work are set out in section 5.6. Lastly, section 5.7 presents some concluding remarks about the accomplishments of this thesis and the development of research skills by its author.
5.2 The Relative Influence of the Four Social Control Measures

The primary objective of the study was to determine the weights of the four environmental social controls as influences on the capital investment decision-making of the firm. The relative weights of the social controls derived from the experiment through the self-reported weightings, magnitude of effect calculations and effect size measurements were found to be: stakeholder opinion 36 - 42.5%; subsidisation 26 - 28.5%; regulation 19 - 23%; and mandatory disclosure 9 - 15%.

The weights of environmental factors have important implications for both environmental social control and capital investment decision-making. Additionally, the passive observation scores are in the main, consistent with the findings of the experiment. This is especially the case for the findings about mandatory disclosure, which had clearly very low scores in both studies. The examination of the two studies in tandem provides many benefits. However, it must be remembered that there are significant differences in what is measured in each study.42 In the remainder of this section the four social controls are examined in light of the findings for the two studies. Section 5.2.1 discusses mandatory disclosure; section 5.2.2 discusses stakeholder opinion; section 5.2.3 discusses regulation; and section 5.2.4 discusses subsidisation.

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42 The principle difference is that the experiment is a “what if...” situation, presenting hypothetical cases from which the influence of each social control is measured, by finding the difference in effect at two levels (better and worse). The passive observation survey measures manager’s perceptions of the influence of the social controls measures in the current Australian situation. The respondents to Stage 2 are a subset of respondents to the passive observation study, who agreed to participate in the second stage. As they are self-selected, there is a possibility that the Stage 2 respondents may be more environmentally aware or socially responsible (and consequently more sensitive to stakeholders) than the broader Stage 1 population.
5.2.1 Mandatory Disclosure

The most striking finding of the study is that mandatory disclosure is by all measures clearly the variable with the least influence on capital investment. The experimental weightings ranged from 9% to 15%. The Mean 1 score in the passive observation study also showed mandatory disclosure to have the lowest influence of the four social controls. The standard deviations for both the passive observation study and the self-reported weightings were also relatively lower than for the other social controls indicating a high level of agreement among the managers about this factor. This is especially the case for the self-reported weightings with a S.D. for disclosure of 8.82 as compared to 11.4 (regulation), 17.51 (subsidisation) and 19.61 (stakeholder opinion).

In the experiment the managers were considerably less responsive to changes in the levels of this variable than the other three variables. The passive observation study indicates that at current levels it is also low in influence. However, there was some variation in the influence of the four indicators. Likely explanations for this variation are:

1. Some requirements apply to a wider group of respondents than others – this may be the case for the Directors' Report;
2. More publicity about the introduction of some requirements (again this may apply to the Directors' Report disclosure requirement); and
3. Length of time that the requirement has been in place – respondents may be more likely to have heard of long standing requirements than newly introduced ones.

Where the managers reported a higher level of awareness, the influence of the requirement was higher. The most influential requirement was Directors' Report disclosure, which is
likely to be the requirement applying to the greatest number of respondents. Financial statement disclosure requirements, which should also be widely known and understood by most financial managers, had the second highest influence. Third was National Pollutant Inventory disclosure. The newness of this requirement may explain the large percentage of managers not aware of its requirements.

Least influential was expected increase in disclosure requirements. This possible increase in environmental disclosure requirements has been reported frequently in Australian accounting professional journals in recent years, so information has been widely available. Despite this many managers indicated lack of awareness and consequent lack of influence of these requirements. This disinterest is consistent with the findings of Wood (1998), which suggests that managers believe environmental information in financial reports would not be understood, and that many users do not want to read financial reports at all. The findings of this study clearly indicate that the managers consider mandatory disclosure to be relatively low in influence.

Viewed in light of the finding that the environmental social controls have much less influence than the mainstream financial and strategic factors, the influence of mandatory disclosure on the capital investment decision appears to quite minimal. It is apparent that for many managers the high influence of stakeholder opinion does not translate into concerns about mandatory environmental disclosure. Increased education of managers about disclosure requirements and widening the application of disclosure requirements might increase their effectiveness.

The Stage 2 respondents are possibly more socially responsible or interested in environmental issues. Despite this, in the experiment they attributed low weights to the
influence of mandatory disclosure. This is consistent with the passive observation study in which the mandatory disclosure influence scores were the lowest of the four social controls. Whilst this finding does not augur well for environmental disclosure, it does provide strong support for the veracity of the findings about the weight of mandatory disclosure.

5.2.2 Stakeholder Opinion

The three measures used in the experimental study exhibit fairly close correspondence, showing stakeholder opinion to be relatively a very important social control, with more than 30% of the combined weight of the social controls. This finding provides strong evidence of the relative weight of stakeholder opinion. The passive observation study found the mean stakeholder opinion influence score to be 3.67 (also a fairly high score relative to the other three social controls\(^4\)). The finding of high influence in both studies provides further reassurance about the high influence of stakeholder opinion.

The experiment was limited to measuring the collective influence of stakeholders. However, the passive observational study provides some compensation for this limitation by examining the relative influence of a range of stakeholders. The stakeholder literature indicates that stakeholders vary in influence according to power, legitimacy and urgency of their claims on the firm (Mitchell, Agle and Wood, 1997; Fineman and Clarke, 1996). The views of Mitchell et al (1997) and Agle et al (1999) were supported as managers were found to have a hierarchy of stakeholders.

\(^4\) Mean influence scores for the other social controls were – subsidisation 2.66, regulation 3.84, and disclosure 1.19.
An examination of the overall stakeholder influence scores shows that employees and customers ranked amongst the most influential stakeholders, surprisingly higher than creditors and investors. This differs from Fineman and Clarke’s (1996) UK study which found customers and employees to be of low importance as an influence on environmental performance. Stakeholder opinion was marginally less influential than regulation in the passive observation study. This confirms the finding of Tilt (1997) that regulation was the most influential factor (to the environmental performance of the firm, not specifically to capital investment). However, in the experiment stakeholder opinion was weighted much higher than regulation. This suggests that managers are much more responsive to variation in levels of stakeholder opinion than they are to variation in the levels of regulation.

This is an important finding because it supports the current trend towards the use of economic instruments as an alternative or adjunct to ‘command and control’ regulation. It further adds support to the views of Schmidheiny and Zorraquin (1998) and Gunningham et al (1999) who indicate the effectiveness of market forces as a means of influencing the firm’s environmental performance and suggest their further use as a means of environmental social control. As economic instruments rely on harnessing market forces, they are more likely to be successful if managers are responsive to stakeholder opinion.  

However, it must be cautioned that economic instruments may at times provide perverse incentives. In their comments on the sulfur trading scheme for electricity utilities, Lober and Bailey (1997:472) illustrate this point: “Investment in new technology with cleaner production processes by firms would be a desirable outcome of the scheme, but evidence indicates that in many instances, tradeable emissions schemes have driven firms in the opposite direction.”
5.2.3 Regulation

Regulation was weighted only third in influence by the Stage 2 respondents, with a range of 19.32% to 23% across the three measures used in the experiment. Corresponding with the findings of Tilt (1997) the passive observation study found regulation to be the most influential variable with a total mean score of 33.83%. The findings of Sharma, Pablo and Vреденберг, (1999) suggest a possible reason for the difference between the results of the experiment and the passive observation study on regulation. They found that many managers have instructions to “invest only enough to get a clean chit from the regulators”. The larger population of Stage 1 respondents might include many managers who are subject to such a policy. Not surprisingly, these managers considered regulation the highest influence, whereas managers who completed the decision experiment clearly considered stakeholder opinion as relatively more influential. This does not necessarily imply that the Stage 2 respondents view regulation as unimportant, rather it may be that they have surpassed the level of focussing only on basic compliance with regulation.

The passive observation study investigates current regulatory costs. It also investigates nine regulatory indicators, whereas only the collective term ‘regulation’ is used in the experiment. The regulatory indicators were all relatively quite high in influence. However, the direct regulatory costs (‘sticks’) were of most influence, rating above costs of various forms of pollution damage. Perhaps the greatest concern arises from the finding that charges for emissions to air and water have the lowest mean influence score, coupled with the indications of relatively low charges in the literature (EPA (NSW), 1998 and Sydney Water). It appears that the level of current charges is insufficient to influence many firms to make more costly investments in less polluting plant and equipment. Rather than creating a “trade off” situation where less polluting capital equipment is worth the
extra cost to reduce pollution charges, the EPA (NSW) may be providing ‘hidden subsidisation’ in the form of minimal charges.

The finding of relatively low influence for expectation of future increases in compliance costs, further reinforces this perception. This finding contrasts with White et al’s (1995) USA study in which this factor was of relatively high influence. One of the stated objectives of the NSW load-based licensing scheme is to provide incentives to industry for ongoing improvements in environmental performance and the adoption of cleaner technologies (EPA (NSW), 1998). However, in relation to capital investment this appears to have had only a low impact. Internal and external property damage were also at the low end of the influence scale. Bates (2000) considers that clean-up provisions in Australia are subject to the same criticism as CERCLA in the USA\(^{45}\) and could be very costly for firms.

However, it appears that concern about clean-up costs has not as yet impacted highly on capital investments. Overall, the weight accorded regulations is somewhat less than desirable from an environmental point of view. The introduction of carbon taxes and higher charges for removal of trade waste through the drainage system might be considered as options for influencing capital investment.

### 5.2.4 Subsidisation

Subsidisation, the ‘carrot’ among social controls, was found by the three measures of the experiment to be a highly influential factor, with weightings of 26% to 28%. This was second only to stakeholder opinion. The change from ‘better’ to ‘worse’ levels of

\(^{45}\) Bates is referring to retrospective liability - which means that operators or occupiers and lenders may be liable for the actions of previous owners or occupiers of the property.
depreciation allowances in the decision cases was highly influential to the managers. The passive observation study mean influence score of 2.66 on the scale of 0 to 7 is an indication of the managers' response to the current low level of environmental depreciation allowances. The relatively high level responsiveness of managers to change in the level of this variable suggests that managers would be very responsive to increased subsidisation. This finding adds support to the suggestion in literature (EPA [South Australia] 2001; Lockhart, 1997) that subsidies can be very effective as an incentive for environmental improvement.

Only 26 managers indicated that they were aware of a direct environmental subsidy received by their firm. These managers reported the mean score for the influence of subsidisation as influenced by this subsidy as 3.63 (compared to the mean score for depreciation allowances of 2.66). This is much higher than for subsidisation through the tax system. Coupled with the finding of the experiment, it adds support to the conclusion that there is room for increased use of subsidisation and the likelihood that it will prove an effective means of driving (particularly small firms) toward more responsible capital investment. Given the small number of respondents to the direct subsidy question (n = 26), only tentative conclusions can be made, however these findings are consistent with literature (EPA, [South Australia], 2001; Lockhart, 1998).

The success of the South Australian scheme for small firms suggests that there is much to be gained by use of similar schemes in other states. The cost of these schemes is not necessarily prohibitive. For example, the grant for environmental consultancy provided by the EPA (South Australia) cost only $15,000 per firm and (as illustrated by the South Australian Brewing Company case study in section 2.3.1.2) resulted in significant improvements in the firm's environmental (and financial) performance. Also, some (or all)
of the cost to government can be offset by increased tax receipts from higher profits made by firms, savings in the cost of 'policing' of small firms, and reduction in environmental damage.

5.3 Theoretical Implications of the Findings

In this section the findings of the empirical research are examined from the perspective of positive and stakeholder theories. These two theories offer differing perspectives on the way in which managers view their accountability to society. The examination of theoretical implications works in two directions, as the theories may be used to explain the perceptions of the managers about the influence of the social controls. Also the perceptions of the managers can be used as a test of the practical adequacy of the theories.

The role of trust between principal and agent is acknowledged in the stakeholder-agency model (Agle et al, 1999). It suggests that managers are at a central node in the firm and have the responsibility to reconcile many divergent interests of various stakeholders. Managers will give priority to the stakeholders whom they perceive as most salient. Power, urgency and legitimacy determine which stakeholders are salient (Agle et al, 1999). From this perspective, the contract with owners/shareholders gives these stakeholders power and legitimacy and hence salience.

Agle et al’s (1999) finding that urgency is the best predictor of stakeholder salience, provides another perspective on the environmental crisis. If the environment is held to be a stakeholder, then the finding that the mainstream financial and strategic factors are significantly more influential than the environmental factors, suggests that managers do not
perceive urgency in the environmental crisis, since environment has low stakeholder salience.

Other stakeholders may gain salience through urgency. For example, green pressure groups and credit rating agencies may ordinarily lack salience and be rated as a low influence. It is possible that if the activity of these groups is targeted at the firm, the threat to reputation and hence the profits of the firm may alter the manager’s view of their influence. This study investigates the manager’s perceptions of influence at a point in time. However, it is possible that their responses might differ if the study were repeated after some significant environmental event, such as the prosecution of the firm or an environmental accident.

From a more positive perspective, Stanwick and Stanwick’s (2001) finding of a significant negative relationship between CEO salary and environmental reputation suggests a reason for managers to act within the confines of their contracts. The implication of this finding is that managers will not be motivated to place high importance on investing in less polluting capital equipment. However, managers must balance their need to make economically rational decisions with the social requirement for good environmental performance. As illustrated in the discussion in section 3.4.4, if capital investment decisions are to be economically rational they must take account of environmental performance. This is because poor environmental performance can lead to (inter alia) increased costs of capital and insurance (Schmidheiny and Zorraquin, 1998) and capital investment is a key activity in pollution prevention (White et al, 1995).

Social controls are likely to work best if directed towards aligning the (economically rational) goals of business with society’s need to improve the environmental performance
of the firm. This notion is well supported in the literature (e.g., Fuchs and Mazmanian, 1998; Schaltegger, 1997; Epstein, 1996; and Brundtland, 1987). In this thesis it is held that environmental social controls provide economically rational reasons for investment in less polluting plant and equipment. However, the level of effectiveness of these controls varies. The findings of this study suggest that some regulatory costs (notably, emissions to air and water) are inadequate in terms of their influence on capital investment. The finding of relatively very low influence suggests mandatory disclosure requirements, as yet, contribute very little as an influence on capital investment.

5.4 An Overview of the Three Industry Sectors

In this section the data on each of the social controls is drawn together to provide an overview of each industry sector.\textsuperscript{46} The survey responses indicate that the extractive industries are the sector most influenced by the social controls. Extractive industry mean scores were (on average) at least one point higher than those of the metal and food industries. The metal industries emerged as the sector consistently least influenced by all the social controls. For each of the three industry groups, data on each social control measure is summarised and discussed below.

5.4.1 Extractive Sector

The extractive sector is characterised by its high level of responsiveness to the social controls. The extractive industries were the highest scorers for influence on capital

\textsuperscript{46} The industry analysis was limited to three industries with the largest numbers of respondents, as the number of respondents from each of the other sectors was too small for meaningful statistical analysis.
investment across all measures in the study (both environmental and non-environmental). A likely explanation for extractive sector responsiveness is that mining is highly capital intensive, with large investments required for acquisition of sites and also for plant and equipment. This makes capital investment a very important issue for extractive industry firms. Also the extractive sector has been subjected to a high level of public scrutiny in recent years. This has made environmental performance a crucial issue for this industry.

For mandatory disclosure, the extractive sector reported relatively low influence. Even so the influence level was high compared to the other two sectors. Extractive sector managers showed a much higher awareness of disclosure requirements than the other sectors probably due to more stringent disclosure requirements for this sector.

For the regulation indicators ‘site restoration/remediation,’ ‘licences/permits’ and ‘environmental fines and penalties’ were the most influential indicators. Of some concern is the finding that despite the bad publicity about tailings dam collapses in recent years, ‘hazardous waste treatment and disposal’ emerged as only fourth in influence.

The subsidisation indicators showed the depreciation indicator to be more influential in the extractive industry than the other industry sectors. Managers of firms receiving a direct subsidy were also strongly influenced by these subsidies.

The extractive industry managers’ assessments of stakeholder influence differed from the other sectors, with higher influence scores reported for all indicators. Interestingly, only the extractive industry managers indicated that investors, insurers and creditors were more influential than employees and customers. One possible reason for this is the extractive
industry's large export market. Customers in other countries are less likely to be concerned about environmental performance in Australia than Australian customers.

As the majority of extractive sector respondents were from publicly listed firms this may account for the higher influence of investors in the extractive sector. The extractive industry is subjected to a high level of public attention in regard to its environmental impacts, so it is not surprising that its managers displayed a higher than average level of responsiveness to stakeholders. However, given the capacity of green pressure groups and credit rating agencies to damage the firm's reputation, it is surprising that these groups were reported to have relatively very low influence.

5.4.2 Metal Sector

The metal sector is characterised by low influence scores relative to the other sectors studied. The regulation indicators showed 'hazardous waste treatment and disposal' to be of greatest concern to the metal sector. However, 'future increases in compliance costs' was also high in influence. This is somewhat surprising given the low influence of all the regulatory indicators. 'Charges for emissions to air/water' was reported to be the least influential indicator. The metal sector also produced the lowest subsidisation influence scores across all the industry sectors for depreciation. However managers of firms which receive a direct subsidy reported a significantly higher influence level for direct subsidisation.

The stakeholder opinion indicators showed 'customers' and 'employees' as the most influential groups. The lower influence of investors may be explained by the large number of proprietary companies in the metal sectors. Green pressure groups and credit rating
agencies again were reported as the least influential. However, this is not surprising as the metal sector supplies predominantly to other manufacturers and seems to escape much of the public scrutiny which is directed to the extractive sector.

Mandatory disclosure influence was much lower than in the extractive sector. However, the much higher influence score for managers who were aware of disclosure requirements suggests the need for more stringent requirements and education of managers about these requirements. This is especially the case because the metal industry can be considered as highly polluting.\footnote{According to the US EPA’s Toxic Release Inventory Report (1995) the primary metals sector was second after the chemical industry in overall toxic releases (Kertes, 1997).} The low influence of the social controls on its capital investment decision-making is therefore of great concern.

5.4.3 Food Sector

The food sector does not generally attract a high level of public attention in regard to its environmental performance. However, many food sector firms use highly polluting chemicals and must report to the National Pollutant Inventory, so the food sector cannot be considered as environmentally benign. The food industry was most influenced by fines and penalties, followed by licences and permits. It appears that the food industry responds more to sticks than to carrots. The regulation indicators showed that despite the large number of food sector firms which use highly toxic chemicals, site restoration was the least influential regulatory indicator.
The subsidisation data indicates that food was the sector least influenced both for taxation subsidies and direct subsidies. The likely reason for this is that the food industry is less capital intensive than the extractive and metals industries.

The food sector managers reported employees and customers to be most influential. This finding may be influenced by the large number of proprietary companies in the food sector, which are generally more insulated from stock market forces. Credit rating agencies and green pressure groups were again reported by managers as having the least influence on capital investment.

The influence of mandatory disclosure requirements was relatively very low, although for managers in the food industry who were aware of these requirements they were highly influential.

5.5 Limitations of the Study

As with all research methods there are limitations in the scope, design and application of this study. Two research methods have been used with the intention of ‘triangulating.’ Thus some of the deficiencies of experimentation have been minimised by the use of passive observation and vice versa. Despite this, limitations remain and these are discussed below.

5.5.1 Limitations in Design

The general limitations of self-administered survey research apply to the empirical work of this thesis. Limitations in design are principally related to the limited contact between the
researcher and respondents, which does not readily allow the researcher to gain clarification of responses or additional information on points of interest. A further problem may arise from systematic differences between non-respondents and respondents.

As noted in section 3.3.1.1 experiments have been criticised for being oversimplified and lacking in reality. The respondents' indication that they would be likely to change their decisions if provided with more information suggests that the sparsity of the information has created uncertainty. It is possible that the uncertainty that arose from the limited information provided may have produced more constrained decisions. However, the use of relative measures means that this possible biasing factor would apply equally to all the variables. Thus, there is likely to be little change in the relative influence of each measure.

The alternative would be the provision of more specific details in the decision cases. However, this could have resulted in more serious bias creeping in. For example, the terms and practices used may differ between industries, so an appropriate scenario for one industry could be quite inappropriate for others. The differences in terminologies and practices may thus give rise to misunderstandings or inappropriate decisions by some respondents.

The scale used to record the influence scores in Stage 1 of the survey was discussed on section 3.3.3.4. The scale ranged from 1 to 7 with a not applicable (N/A) alternative option available for respondents did not consider the variable in their capital investment decision. If the factor was viewed as not applicable it was held that it had no influence and was scored as zero. Respondents to whom the variable was applicable but who considered its influence as minimal would be likely to chose a score of 1. However, an inherent limitation of this design is the possibility of confounding between scores of zero and one.

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5.5.2 Limitations in Scope

The individual manager disposition towards environment variable included in the model as a moderating variable, was not included in the empirical study. This is a complex and elusive concept presenting many difficulties in measurement. Additionally, as noted by Sharma et al (1999), managers generally have little discretion and must make capital investment decisions according to policy and “the instructions from the top.” As a consequence it is likely to account for only minimal variance in the model and relying on the principle of Ockham’s Razor it was omitted from the study.

The existence of an error term suggests that some factors, which have not been identified, may be of importance in explaining variance. Some possible sources of error variance may be differences which vary systematically with industry type or firm size. As noted above, individual manager disposition may also account for some variance.

5.5.3 Limitations in Application

The study was limited to testing in the Australian situation. The general impacts of social controls are likely to be comparable in other developed nations. However, laws and regulations may differ in some respects and responses to laws may also vary due to cultural differences. Therefore caution must be exercised in generalising to populations in other countries.
5.6 Suggestions for Future Research

The limitations set out in the preceding section suggest a number of possible directions for future research. As this work presents an overview of a broad and complex topic, many areas of the study would benefit from more in-depth investigation. Continuing work is needed on the constructs employed in order to increase the level of confidence in the findings. Additionally, more work is needed to provide an in-depth examination of the influence of the social controls on capital investment.

In terms of scope, investigation of individual manager’s disposition towards environment as a moderating influence on capital investment decision-making could be pursued. A possible research question which addresses this deficiency is: ‘To what extent does individual managers disposition towards accountability play a role in influencing the firm’s capital investment decision-making and its response to the social controls?’ The Managers disposition is multifaceted and investigation of this variable could include various aspects of disposition such as disposition towards environment and disposition to obey regulations.

A number of decision parameters of the capital investment decision may exist, which are as yet unidentified. These are most likely to relate to individual differences between decision-makers, industry differences, and size effects. Case studies of industry sectors or firms within various sectors would provide the opportunity to carry out in-depth investigation, which might identify these differences. Additionally, case studies of real situations would serve to enhance and further test findings of this study which suffer from the constraints of hypothetical situations and experimental and survey methodologies. More specifically, case studies of the extractive and metal sectors would inform about reasons for the strong contrasts in their responses to the social controls.
The investigation showed industry effects where the extractive industries are more sensitive to regulations in their capital investment decisions, and firm size effects where larger firms are likely more conscious of regulations. These findings show that the importance of regulations varies across firms. This variance should be investigated and considered in the practical application of regulations by government authorities.

Although size effects were detected, they were limited and patchy. Relying on the literature (Tilt, 1997), it was expected that stronger size effects would be detected. It is possible that larger populations within industry sectors are needed to detect size effects.

New developments such as the changing role of banks and insurance companies create another research opportunity. Insurance companies were found to be somewhat more influential than banks. Schmidheiny and Zorraquin (1998) suggest that insurance companies fulfil an advisory role in regard to firms' environmental performance. To what extent insurance companies or banks act in this capacity is uncertain and the nature of the involvement of these two groups would further inform the literature on the social controls.

Fineman and Clarke's (1996) UK study found employees and customers to be of low influence in contrast to the findings of this study, which ranked them higher than creditors and investors. The reasons for this difference are as yet unclear and further investigation is needed. Possible reasons are differences in the study population, time differential, and associated social changes.
Given that regulation can be a very important social control, the findings of this study raise some concerns about whether regulation is being used to its full potential as a social control measure influencing responsible capital investments.

Of even more concern, subsidisation appears to be a very much under-used resource. The literature suggests that subsidisation can be used to achieve significant environmental improvements, particularly in regard to capital investment. EPA (South Australia) (2001) indicates that the cost of interest free loans and consultancy grants to enable small and medium-sized firms to make investments in pollution-reducing plant could be offset by many benefits to the community. These include reduction in health problems, pollution and monitoring costs and tax benefits which flow from improved profitability of the recipient firms. Additionally, environmental tax concessions allowed in Australia are very small. The experimental findings indicate that managers are very responsive to changes in the level of depreciation allowances.

Although there are many case studies on subsidisation, little attention has been paid to the low level of tax subsidisation. Environmental depreciation allowances currently provide little more than the capacity to claim depreciation on non-income earning investments. This study provides an early indication of the potential of this resource. New research ought to focus on how this most universal form of subsidisation could most profitably be used, as well as optimal levels of depreciation. Subsidisation, both direct and indirect, appears to be an area of social control where there are many ‘low-hanging fruits’ to be picked.

Perhaps the greatest concern arising from this study was the low influence of mandatory environmental disclosure. More research is needed to investigate the reasons for this low
influence and ways of improving the effectiveness of this very costly social control measure.

Finally, a comparative study of the responses of firms from different nations would also serve to overcome the limitation in application created by the use of only Australian investment managers.

5.7 Concluding Remarks

This thesis has substantially enhanced knowledge of environmental social controls by bringing together disparate literature on each of the four social controls and investigating their influence on the capital investment decision-making of Australian managers. This advancement of knowledge contributes both to the literature on capital investment decision-making and to the literature on the use of environmental social controls.

The discussion of the social context of the study in section 1.2 illustrated the problems for society in determining the optimal efficiency in the use of societal resources in order to gain the most benefit for the environment. The social controls selected are held to be the key to achieving this optimal level of efficiency. However, the evidence from the empirical work of this thesis suggests that in Australia the optimal level in the use of the social controls has not been achieved.

The study has opened up new areas, which offer the possibility of substantial contributions to environmental research. As introductory research, there are a number of deficiencies in its design and scope and our understanding of both the operation of social controls and
capital investment decision-making is far from complete. Therefore replication and extension of this work is needed to increase confidence in its findings.

When capital investment is strongly influenced it is likely that the social controls are effective. The research finding that mandatory disclosure is very low in influence is of great concern. Given the finding of the high influence of stakeholder opinion, it should follow that firms would be similarly influenced by requirements to disclose potentially damaging environmental information to their stakeholders. However, this is not yet the case. One possible reason is that firms can too easily avoid such disclosures. This finding suggests the need for stronger environmental reporting requirements.

The research findings suggest that firms are strongly influenced by regulation. However, Australian regulatory requirements are very weak in comparison to those of other developed nations. There is room for much to be achieved by strengthening regulatory requirements. The evidence suggests that whilst Australian EPAs and other regulatory authorities espouse the ‘user pays’ principle, there are a number of areas where it is not effectively implemented. In particular the water authorities trade waste schemes were indicated to be of little influence on firms.

Higher regulatory charges might be offset by greater use of subsidisation. Many firms were found to be very responsive to subsidisation, yet there is little use of subsidisation either through the tax system or through grants or interest free loans. Some managers appear to use configural cue processing in their decision-making and offset subsidisation against regulatory charges. This suggests the capacity of these two control measures to be used in combination. There is much room for increased use of subsidisation.
In this introductory study only a broad indication of the relative effectiveness of the social controls has been achieved. However, this study has provided some indications of ways in which more effective use could be made of environmental social controls. The study has opened up new areas, which offer the possibility of substantial contributions to environmental research.

Despite these deficiencies, the study’s findings about the influence of key social controls on capital investments provides a road ahead to more environmentally-responsible decisions. Positive reinforcement of their importance in influencing firm decisions should further empower various stakeholder groups. Likewise government actions which enhance the position of stakeholders in encouraging greener decisions are supported by this research.

Finally, the development of new knowledge in the production of this thesis has, as well, substantially developed the knowledge and understanding of its author in both the topic of the thesis and the research process. Perhaps most importantly, this research has provided basis for the development of a broad research platform and engendered a satisfying sense of excitement and creativity, which will undoubtedly lead to the further development of this research platform.
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*Environment Protection Act South Australia* (1993)

*Environmentally Hazardous Chemicals Act 1985 (NSW)*


*Pollution Control Act 1970, (NSW)*

*Protection of the Environment Administration Act 1991, (NSW)*

*Protection of the Environment Operations Act 1997(NSW)*

*Waste Minimisation and Management Act 1995 (NSW)*
Appendix One

Covering Letters and Reminder Letters

1. Covering Letter for Stage 1 Survey Questionnaire
2. Covering Letter for Stage 2 Survey Questionnaire
3. Reminder Letter for Stage 1
4. Reminder Letter for Stage 2
Stage 1 Covering Letter
(Printed on University letterhead)

18/1/2001

Dear Capital Investment Manager,

Capital investments in new plant and equipment can be very important to firm performance. Environmental costs can be highly material to the capital investment decision. Little work has yet been done to explain how environmental concerns and related costs influence capital investment decisions.

As a finance manager involved in capital investment decision-making, you have been selected to participate in this survey. For the results to truly reflect the thinking of Australian financial managers, it is important that each survey be completed and returned. Whilst we are mindful of the pressures that modern business places upon people in a position of responsibility, we would very much appreciate your contribution of 15 to 20 minutes to complete the survey. Doing so will help facilitate further studies to aid financial decision makers to make more cost effective investment decisions. It may also provide information to enable business and government to come to a better mutual understanding about the use of natural resources and the environment.

Your participation in the study is entirely voluntary and you are assured of complete confidentiality. No individual responses will ever be released. The aggregated results will be presented to finance professionals and professional organisations and published in journals. If you are interested in the results of the study, we will be pleased to send you a summary of the results. Just write your name and fax number at the end of the questionnaire or fax separately if you wish to retain anonymity. We would also be pleased to answer any questions you may have. Please contact the undersigned.

Thank you for your assistance,
Yours faithfully,

Dorothy Wood

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Stage 2 Covering Letter
(Printed on University Letterhead)

Name
Address

Dear Mr/Ms.,

Thank you for your kind response to my study and your agreement to participate in this follow up investment decision study. Your input is important to the development of knowledge to aid finance and accounting professionals.

This final stage of the study requires you to work through 16 short decision cases. Your last production-related decision is the scenario for all these cases. This scenario is varied in each case by changing the level of four factors between 'low' and 'high'. You are asked to consider how each combination of these factors would affect the relative acceptability of the decision. If you have not dealt with any of these factors in the past, please use your professional judgement as to the decision you would make in such circumstances. It is important that you read the information on page 1 of the questionnaire carefully before completing the decision cases. We would also be pleased to answer any questions you may have. Please contact the undersigned.

The time required to complete the questionnaire is approximately 15 minutes. Your participation is entirely voluntary and you are free to discontinue participation at any time. Again you are assured of complete confidentiality. No individual replies will ever be released. The aggregated results of this follow up study will be presented to finance professional and professional organisations.

Thank you for your assistance,
Yours faithfully,

Dorothy Wood

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Reminder Letter for Stage 1
(Printed on University letterhead)

The Finance Director/Manager

12th February 2001

Dear Sir/Madam,

About one month ago I wrote to you asking that you complete a questionnaire about environmental costs and their influence on your capital investment decision-making. As of today we have not received your completed questionnaire. I am writing to you again because your response is very important. In order for the results of the study to be truly representative of the opinions of Australian financial managers, I would greatly appreciate your input.

I have undertaken this study because I believe that this research will assist those working, and those training to work in capital investment decision-making.

In the event that your questionnaire has been misplaced a replacement has been enclosed. The time required to complete the questionnaire is approximately 20 minutes. You are assured of complete confidentiality. No individual responses will ever be released.

Your cooperation in completing the survey is greatly appreciated.

Most sincerely,

Dorothy Wood

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Reminder Letter for Stage 2
(Printed on University Letterhead)

8/1/2001

Name
Address

I am writing to thank you for agreeing to complete our follow-up capital investment study questionnaire. If you have already completed and returned the questionnaire to us please accept our sincere thanks. We are very grateful for your help, as it only by asking people like yourself to share their experience that we can gain a fuller understanding of the relationship between environmental costs and capital investment decision-making.

If you have not yet completed the questionnaire, your cooperation in completing it as soon as possible would be much appreciated. In case the questionnaire has been misplaced, another copy has been included.

Yours sincerely

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Appendix Two

Gladwin’s (1993) Criticisms of Environmental Business Research

Table A3 summarises the list of criticisms drawn from Gladwin’s survey of literature on the greening of industry. However, it would seem that little note has been taken of these criticisms by environmental business researchers. Gladwin’s criticisms imply that there is a need for a more positive approach to environmental business research.

Table A3  Inadequate Research of Greening (Adapted from Gladwin (1993, p.43))

Researchers have not:
- Offered precise definitions, often leading to confused and contradictory findings.
- Produced, after two or three decades of attention, what anyone could rightfully consider as a great wealth of high quality empirical findings.
- Systematically built on one another’s work.
- Been very enthusiastic about causal directionality – very little research has been conducted to determine the antecedents or consequences of greening of organisations.
- Based much of their work on rigorous hypothesis-testing logic that rules out alternative explanations – empirically testable propositions are missing from the bulk of all greening research.
- Conducted very much systematic comparison of their discoveries across industries, across firm size, across societies.
- Explicitly incorporated dynamics into their study designs, relying overwhelmingly instead on static, cross sectional methodology – no programmatic, long term longitudinal research efforts on greening appear to exist.
- Worked very hard at building and validating general models, instead being content to operate at the level of historical particulars.
- Always distanced themselves from advocacy and ideology.
- Attempted to place their work into broader streams of organisational research dealing variously with change, quality, ethics, globalisation, leadership, transaction costs, and so forth.
Appendix Three

Main Economic Instruments Used in Australia

Table A4 summarises the main economic instruments in use in Australia. Many have very limited application to private industry. For example, the South Creek Bubble Licence Scheme applies only to state operated sewerage treatment works.

Table A4 Continuing environmental schemes using economic instruments in Australia

**Property Rights and Market Creation**
- Hunter River salinity trading.
- Murray-Darling Basin Commission salt credit trading scheme.
- South Creek bubble licence scheme to reduce phosphorus levels in Hawkesbury-Nepean river system.
- Murray-Darling Basin tradeable water entitlements.
- Individual transferable quotas in fisheries (Southern bluefin tuna, South east fishery, Northern Prawn fishery).

**Charges and Taxes**
- South Australian effluent charges.
- Load based licensing schemes in Victoria and Western Australia covering air, water and land pollutants.
- Product tax on ozone depleting substances.
- Various charges for waste disposal (most local governments).
- Aircraft noise levy.

**Subsidies and Tax Concessions**
- Local government rate concessions to encourage sustainable land management.
- Various subsidies and grants to encourage tree planting and vegetation protection.

**Other Examples of Economic Instruments**
- Environmental performance bonds for Queensland mines.
- Great Barrier Reef performance bonds.
- South Australian beverage container deposit refund scheme.

*Source: Gordon and Dodds (2000)*
Appendix Four

Survey Questionnaire Documents
Capital Investment Decision-Making Survey

Please read the following instructions carefully before you begin.

In this survey, we will be asking you about your capital investment decision-making, and how various factors influence your decision. The factors include both standard financial and strategic factors and also ‘environmental’ factors. ‘Environment’ in this study refers to pollution and related issues.

Selecting a Capital Investment Decision:
Please select the last *production-related* capital investment decision you were involved in making. Suitable investments may include but are not limited to investments which might be considered specifically ‘environmental.’ Examples of relevant investments are replacement of old plant or plant for a new production process.

You are asked to indicate the extent to which each factor influenced your decision. To indicate the extent of influence of each factor, please circle one number clearly on the scale.

Part 1 Mandatory Disclosure and Subsidisation
Some items may not be relevant to your decisions. In this section, if you do not need to answer the rest of the question, you will be given a “skip” instruction. “Skip” means move on to the next question.

**D1** (i) Are you aware of a requirement for disclosure of information by your firm in the annual Directors’ Report about its environmental regulatory compliance?
1. No □  skip to D2
2. Yes □

(ii) What is the extent of your knowledge about this requirement? ........................1 2 3 4 5 6 7

- If your rating for part (ii) was 4 or higher please answer part (iii)

(iii) To what extent does this requirement for disclosure of information in the annual Directors’ Report influence your capital investment decisions? 1 2 3 4 5 6 7

**D2** (i) Are you aware of requirements for disclosure of environmental information in your annual financial statements?
1. No □  skip to D3
2. Yes □

(ii) What is the extent of your knowledge about this requirement? ........................1 2 3 4 5 6 7

- If your rating for part (ii) was 4 or higher please answer part (iii)

(iii) To what extent do requirements for disclosure of environmental information in your annual financial statements influence your capital investment decisions? 1 2 3 4 5 6 7
D3 (i) Are you aware of a requirement for disclosure of environmental information by your firm about its pollutant emissions, for use in the national pollutant inventory?

1. No [ ] skip to D4
2. Yes [ ]

↓

(ii) What is the extent of your knowledge about this requirement?......1 2 3 4 5 6 7

If your rating for part (ii) was 4 or higher please answer part (iii)

↓

(iii) To what extent does the requirement for disclosure of information about pollutant emissions in the National Pollutant Inventory influence your capital investment decisions? ...............1 2 3 4 5 6 7

D4 (i) Are you aware of expected increase in environmental disclosure requirements in the financial statements?

1. No [ ] skip to S
2. Yes [ ]

↓

If your answer was yes please answer part (ii)

↓

(ii) What is the extent of your knowledge about this requirement?..............1 2 3 4 5 6 7

If your rating for part (ii) was 4 or higher please answer part (iii)

↓

(iii) To what extent does the expected increase in environmental disclosure requirements in the financial statements influence your capital investment decisions? .........1 2 3 4 5 6 7

S1 Please indicate the degree to which environmental depreciation allowances influence your capital investment decisions?

Low Influence 1 2 3 4 5 6 7 High Influence

S2 (i) Are you aware of any direct subsidies/grants received by your firm to aid in making environmental improvements?

1. No [ ] Skip to Section 2
2. Yes [ ]

↓

If Yes please answer Part (ii)

↓

(ii) To what degree do these subsidies/grants influence your capital investment decisions?

Low influence 1 2 3 4 5 6 7 high influence
Part 2: Please indicate the relevance of each item to your decision.

**A. Regulatory Factors:**

Note: Examples of property and resource damage are spillage and seepage of groundwater.

<table>
<thead>
<tr>
<th>Item</th>
<th>Not Applicable</th>
<th>Low Influence</th>
<th>High Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1 Charges for emissions to air/water</td>
<td>N/A</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>R2 Hazardous waste treatment or disposal</td>
<td>N/A</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>R3 Expectation of future increases in compliance costs</td>
<td>N/A</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>R4 External property damage</td>
<td>N/A</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>R5 Internal property damage</td>
<td>N/A</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
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<td>R6 Natural resource damage</td>
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<td>R7 Site restoration/remediation</td>
<td>N/A</td>
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<td>R8 Environmental fines/penalties</td>
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<td>R9 Licences/permits</td>
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**B. Stakeholder Opinion:**

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<td>SH2 Insurance companies</td>
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<tr>
<td>SH3 Banks/creditors</td>
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<td>SH4 Credit rating agencies</td>
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<td>SH5 Employees</td>
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<td>SH6 Customers</td>
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<td>SH7 Suppliers</td>
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**C. Environmental Costs**

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<td>Low Influence</td>
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<td>---</td>
<td>----------------</td>
<td>---------------</td>
<td>----------------</td>
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<tr>
<td>C4 Cost of environmental training of employees</td>
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<tr>
<td>C5 Air/waste water/hazardous waste monitoring</td>
<td>N/A</td>
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<tr>
<td>C6 Air/waste water/hazardous waste disposal</td>
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<td>1 2 3 4 5 6 7</td>
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</tr>
<tr>
<td>C7 Waste re-use</td>
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<td>C8 Waste recycling</td>
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<tr>
<td>C9 Off-site hazardous waste treatment and disposal</td>
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<td>1 2 3 4 5 6 7</td>
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<tr>
<td>C10 Off-site hazardous waste transport</td>
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<td>C11 Water costs</td>
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<td>C12 On-site hazardous waste storage and handling</td>
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<td>C13 On-site air emission controls</td>
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<td>C14 Reporting to government agencies</td>
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<td>C15 Sales of environmentally friendly/green products</td>
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**Part 3: Mainstream Financial and Strategic Factors**

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<tr>
<td>F1 Fit of project with business strategy</td>
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<tr>
<td>F2 Growth of market related to project</td>
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<td></td>
</tr>
<tr>
<td>F3 Competitive position of company/unit(vis-à-vis external competition)</td>
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<td>1 2 3 4 5 6 7</td>
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<tr>
<td>F4 Effect on product quality</td>
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</tr>
<tr>
<td>F5 Effect on productivity</td>
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<td>1 2 3 4 5 6 7</td>
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</tr>
<tr>
<td>F6 Effect on achievement of profit and sales targets for the project</td>
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</tr>
<tr>
<td>F7 Internal rate of return for the project</td>
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<td>1 2 3 4 5 6 7</td>
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<tr>
<td>F8 Return on assets for the project</td>
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<td>1 2 3 4 5 6 7</td>
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<tr>
<td>F9 Net present value for the project</td>
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<td>1 2 3 4 5 6 7</td>
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<tr>
<td>F10 Payback period for the project</td>
<td>N/A</td>
<td>1 2 3 4 5 6 7</td>
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<tr>
<td>F11 If payback period is used, what is the number of years generally required for payback?</td>
<td>________years</td>
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</table>
Part 4: Demographic Information

What is your organisation’s business structure?

(a) Publicly Listed Company  
(b) Proprietary Company  

1. What is the approximate number of full time employees in your organisation?

2. What were the total annual sales of your organisation as reported in last years financial statements?

3. Please indicate the principle industry in which your organisation operates

Food, Beverage and Tobacco...  
Textile, Clothing, Footwear and Leather...  
Wood and Paper Products...  
Printing, Publishing & Recorded Media...  
Chemical and Associated Products...  
Extractive Industries...  
Petroleum & Associated Products...  
Metal Products...  
Machinery & Equipment...  
Other (please specify)... 

Range of Capital Investment Decisions

5. What is the approximate dollar value of the smallest capital investment decisions you make?

6. What is the approximate dollar value of the largest capital investment decisions you make?

7. Are you the only person involved in making capital investment decisions?

1. No  
2. Yes
8. How many years of capital investment decision-making experience have you had?  


9. If you are a member of an accounting organisation, please indicate your affiliation.  
Eg: CPA Society, Institute of Chartered Accountants, National Institute of Accountants,  
other (please specify)  


Your comments are welcome. If you have any additional comments about the issues addressed in this study please write them below:


THANK YOU FOR PARTICIPATING

Your participation in a follow up study would be very much appreciated. The follow up study is a short questionnaire.

I am willing to participate in the follow up study  
1. No 2. Yes

I would like a copy of the results of this study  
1. No 2. Yes

If you answered Yes to either of the above questions, please provide contact details below or fax/phone/e-mail details to Dorothy Wood at:

Fax Number: (02) 9475 4442  phone: (02) 9852 4174  email: d.wood@uws.edu.au

Name:

Company:

Fax Number:

Please return this survey to Dorothy Wood by fax: (02) 9475 4442 or mail: Faculty of Management, University of Western Sydney – Hawkesbury Locked Bag 1, Richmond, NSW 2753

311
PLEASE READ ALL INFORMATION CAREFULLY BEFORE ANSWERING THE CASES.

1. Selecting Your Investment Decision:

Please select the last production-related capital investment decision you were involved in making. This is the scenario for all the cases. Suitable investments may include but are not limited to investments which might be considered specifically ‘environmental.’ Examples of relevant investments are replacement of old plant or plant for a new production process.

2. Decision Cases: Each scenario includes four environmental factors which are “better” or “worse” than your last capital investment decision. In each case the ratings of “better” or “worse” for these factors will be varied. For instance, if the four factors for the decision were: depreciation worse; mandatory disclosure worse; public approval worse; regulatory costs worse; how would this combination of the four factors influence your investment decision? Would it make the investment less (or more) acceptable or make no change in its relative acceptability? If you have not dealt with any of these factors in the past please use your professional judgement as to the decision you would make in the circumstances.

You will be asked to indicate your judgement for each case by circling one number on a scale of 1 to 7. On this scale:

- 0 means N/C - no change in acceptability of the investment
- 1 means low relative acceptability of the investment.
- 7 means high relative acceptability of the investment.

3. Factor Definitions:

- Disclosure means mandatory environmental disclosure required by corporate law and/or accounting standards.

- Regulatory Costs means direct payments on pollutant emissions; clean-up costs; or regulatory compliance.

- Depreciation allowances means higher tax benefits from depreciation allowances.

- Stakeholder Opinion means how the investment will be approved by various stakeholder groups, such as shareholders, creditors, and customers.

PLEASE NOTE: IT IS VERY IMPORTANT THAT EACH CASE BE ANSWERED AS THERE ARE NO DUPLICATIONS IN CASE SETTINGS.
<table>
<thead>
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**Relative acceptability of project:**

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<td>stakeholder opinion worse</td>
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<tr>
<td>regulatory costs worse</td>
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**Relative acceptability of project:**

<table>
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Relative acceptability of project:

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<tr>
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Relative acceptability of project:

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<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>2  3  4  5  6 7</td>
</tr>
</tbody>
</table>


Part B: Investment Manager Assessment

(1) The four variables measured in the decision cases you have just completed are set out below. Please indicate the weight you would place on each of these four variables in your capital investment decision making. To do this you should allocate 100 points among them. Note: each variable must have a value from 0 to 100 with the total sum of values equaling 100.

________ depreciation allowances
________ mandatory disclosure
________ stakeholder opinion
________ regulatory costs

100 Total

(2) Please indicate how confident you feel that your decisions about these environmental factors in the capital investment decision would be the “right ones” for your firm.

Not very confident 1 2 3 4 5 6 7 Very Confident

(3) Please indicate the extent to which you feel your decisions would change if you were presented with additional environmental information.

Not very much 1 2 3 4 5 6 7 Very much

(4) Please indicate the additional environmental information you would want to make your decision

Thank You for Participating

Please return this survey to Dorothy Wood by fax: (02) 9475 4442 / (02) 9852 4185 or mail to: Dorothy Wood, College of Law & Business, Blacktown Campus, Building U2, University of Western Sydney, Locked Bag 1797, South Penrith Distribution Centre, NSW 1797.
The Influence of Environmental Social Controls on the Capital Investment Decision-Making of the Firm: Australian Evidence

Dorothy Wood

Submitted for the Degree of Doctor of Philosophy

2002

College of Law and Business
University of Western Sydney
PLEASE NOTE

The greatest amount of care has been taken while scanning this thesis,

and the best possible result has been obtained.
Statement of Authentication

The work presented is to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare that I have not submitted this material, either in whole or in part, for a degree at this or any other institution.

__________________________
Signature

Dorothy Wood
Acknowledgements

There are two people to whom I owe much gratitude and very special thanks. First my supervisor, Associate Professor Donald G. Ross, who provided support, encouragement and friendship, as well as challenging supervision. Second, my husband John, who made many sacrifices – financial and otherwise whilst I completed this project.

Many others gave generously of their time and expertise but thanks are especially due to the following people:

Co-supervisors Professor Roger Juchau and Associate Professor John Macfarlane for their invaluable guidance and commentary on technical aspects of this study;

The Faculty of Management, University of Western Sydney (Hawkesbury) and more recently the College of Law and Business, University of Western Sydney for generous financial support of this project;

Colleagues from the School of Accounting at the University of Western Sydney for much advice, encouragement, reading and commentary on my work;

Marian Paap for capable assistance in formatting the finished work;

My sons Mark and Tor who contributed moral support, interest in the project and invaluable computer support;

All the kind people who responded to my survey and without whom this project would not have been possible.
Our ways of thinking and perceiving, our desires and behaviors, our ideologies and traditions – all are inherited in significant measure from our civilisation. We may suffer the illusion from time to time that we are going to go our own way, but it is genuinely hard to break out of thought and action that are integral to our culture. Meanwhile, civilisation now rushes ahead with tremendous momentum, and even the individual who believes we are on a collision course with the global environment will find it difficult to separate his or her course from that of the civilisation as a whole. As always, it is easier to see the need for change in the larger pattern than to address the need for it in oneself. Nevertheless, with personal commitment, every individual can help ensure that dramatic change does take place.

I have therefore come to believe that the world’s ecological balance depends on more than just our ability to restore a balance between civilization’s ravenous appetite for resources and the fragile equilibrium of the earth’s environment; it depends on more, even, than our ability to restore a balance between ourselves as individuals and the civilization we aspire to create and sustain. In the end, we must restore a balance within ourselves between who we are and what we are doing. Each of us must take a greater personal responsibility for this deteriorating global environment; each of us must take a hard look at the habits of mind and action that reflect – and have lead to – this grave crisis.

...Now in midlife, as I search through the layers of received knowledge and intuited truth woven into me life, I can’t help but notice similar layers of artifice and authenticity running through the civilization of which I am a part....In a way, then, the search for truths about this ungodly crisis and the search for truths about myself have been the same search all along.

...This life change has caused me to be increasingly impatient with status quo, with conventional wisdom, with the lazy assumption that we can always muddle through. Such complacency has allowed many kinds of difficult problems to breed and grow, but now, facing a rapidly deteriorating global environment, it threatens absolute disaster. Now no one can afford to assume that the world will somehow solve its problems. We must all become partners in a bold effort to change the very foundation of our civilization.

But I believe true change is possible only when it begins inside the person who is advocating it. Mahatma Ghandi said it well: “We must be the change we wish to see in the world.”

Al Gore

_Earth in the Balance: Forging a New Common Purpose_ (pp. 12 – 14)
Overview of the Thesis

Social controls influence the environmental performance of firms and require them to be more accountable for their environmental impacts. Environmental social controls include governmental interventions such as mandatory disclosure requirements, regulation and subsidisation. A second, less formal social control is stakeholder opinion, which acts principally through market forces.

If environmental social controls are inefficient, there are high costs to the community. These include direct costs of implementation as well as health and welfare effects. Despite their importance to the community, the relative influence of environmental social controls is poorly understood. There has been little research into their effect on capital investment decision-making.

This thesis examines the relative influence of environmental social controls on the overall acceptability of the capital investment and provides insight into the perceptions of Australian managers concerning capital investment decision-making. Capital investment has been selected for study because of its importance as “one of the key business activities through which improved environmental accounting practices can foster industrial pollution prevention” (White, Savage, Brodie, Cavander and Lach, 1995, p.2).

An experiment is used to measure the relative influence of the four social control measures. This is supported by a passive observation survey which gauges firm size and
industry influences and also a range of attributes of the environmental social controls on the capital investment decision.

The experiment weightings suggest that the influence of stakeholder opinion on capital investment is very high relative to the other social controls with a weight of around 26 – 43%. Subsidisation with a range of 25 – 28% and regulation with a range of 29 – 23% are somewhat less influential than stakeholder opinion. However, mandatory disclosure is clearly very low in influence with a weight in the range of 9 – 15%. The passive observation survey measured the influence of a range of indicators of each social control and also firm size and industry effects. Firm size effects were weak while industry effects were much clearer and more consistent. A comparison of the influence of the social control indicators and a range of mainstream financial and strategic indicators on the capital investment decision, showed that the mainstream indicators were in the range of 4-5 on a 7-point scale while the environmental indicators were in the range of 2.5 – 4.5.
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