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Towards Sustainable Development: A Business Management Perspective on "Greening" in the Korean Chemical Industry

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DEDICATION

The thesis is dedicated to my father and mother whose love and trust has encouraged me to pursue my dream.

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ABSTRACT

The term, sustainable development, is not new in our society. However, understanding the concept of sustainable development is not without problems. What does the concept mean in business and management? It is observed that ecological issues are neglected by mainstream management academics and practices. Conventional strategic management and organisational study do not include the "green" ecological environment issues as part of business environment. If "green" ecological environment is a part of the business environment, how do decision makers, especially top level managers, perceive green issues in the business environment and how are these perceptions related to strategic management issues?

This research focuses on answering the question by studying how top executives in the Korean chemical industry perceive the uncertainty caused by ecological issues and influence the effectiveness of implementation of corporate environmental management based upon Miles and Snow's (1978) strategic typology of corporate responses.

The research employs three different methods, the questionnaire, the interview and the case study for data collection. These research methods are used to identify the levels of uncertainty which result from green issues in business environment, and the link between uncertainty and strategic management issues.

The findings from this research show that top managers selectively perceive green issues in the business environment. Thus, business organisations seek to create their own environment to match with their strategy rather than be controlled by their environment. The findings support the "strategic choice" view by Child (1972) and Miles and Snow (1978). Selective strategic choice based upon top managers' perceptions produces different types of corporate environmental strategy which range from the reactive to the proactive.

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Chapter One

Introduction

In 1306, the burning of coal was outlawed in London due to the injurious effects of coal smoke (Hite *et al.*, 1972) while the plagues that periodically swept Europe, from the 4th century B.C. through to the 1665 great plague of London, can be partially attributed to improper waste disposal. With the dawning of the Industrial Revolution, however, the emissions of pollutants dramatically expanded both in intensity (Table 1.1) and in geographic reach. As a reaction to local and regional devastation, a number of conservation and protection groups were founded in Europe and America; for example, in 1892 the Sierra Club in the US by John Muir, and in 1895 The National Trust in the United Kingdom.

Table 1.1 Global Sulphur Dioxide Emissions

Year	Million Tonnes per Year
1860	5
1880	15
1900	35
1920	50
1940	70
1960	110
1980	160

Source: The Economist 1989 Survey of the Environment: Costing the Earth

This chapter provides an overview of the thesis. It is composed of i) a background of the historical development of environmental issues in global society, ii) the meaning of "greening" in business organisation, iii) the main contribution of the research, iv) research issues and questions and v) the overall structure of the thesis.

1.1. Historical Background

During the 1960s, there were many publications that brought environmental issues to the attention of a broad public. For instance, Carson's *Silent Spring* (1962) was one of the earliest catalysts of this groundswell. *Silent Spring* documented the damage done to the environment by chemical pesticides, particularly DDT[1]. In a similar vein, Dasmann (1966) and Hardin (1968) gave pictures of the "tragedy of our commons".

In 1972, the United Nations Conference on Human Environment was held in Stockholm. At this meeting, the conflicting perspectives of North and South could be closely observed. The North wanted all countries to clean up and the South wanted economic development. Thus, a fundamental principle which regulates current global common property resources was found to be responsible for the lack of shared ground between North and South. In the same decade the Club of Rome's report *The Limits to Growth* by Meadows *et al.* (1979) raised public fears further over the predicted dire consequences of policies aimed at continued economic growth and put forward the concept of zero growth.

In the 1980s, more optimistic views were espressed. The report *Our Common Future* (the Brundtland Report) by the United Nations World Commission on Environment and Development in 1987 (UNWCED, 1987) introduced the concept of sustainable development globally. In Great Britain, Mrs Thatcher[2] addressed the British Royal Society, in September 1988, and dealt with ecological imbalances and the need to accept

[1] DDT stands for *D*ichloro*D*iphenyl*T*richloroethane. The key problem is the persistence of DDT and its high biological activity. It is estimated that there are several million currents, and most of this ends up in the ocean. Small concentrations (0.01 parts per million) reduce photosynthesis in marine plankton by 20 per cent. The use of DDT is now virtually banned world-wide because of its persistence (Porteous, 1996, p.122).

[2] Mrs Thatcher said "no generation has a freehold on the earth. All we have is a life tenancy and a full repairing lease."

the concept of sustainable economic development in order to stabilise the world's eco-systems. The early 1990s witnessed the second Earth Summit in Rio de Janeiro in 1992 where political leaders from the world's nations signed up to an agenda addressing the environmental, economic, and social challenges facing the international community in moving towards sustainable development. In the late 1990s, more optimistic terms like "sustainable business" or "sustainable global economy" emerged in government and industry. That is, governments and businesses began to regard environmental policy and management issues from a strategic perspective, one which could deliver competitive advantages to national economies and individual global business organisations and at the same time allow for sustainability (Welford, 1998).

In the European Union (EU), similar movements were observed. The environmental policy of the EU moved from command and control type in the 1970s and 1980s to the introduction of economic market-based instruments (e.g. landfill levies, carbon taxes, tradable emission permits) and voluntary agreements in the 1990s. Examples of these voluntary agreements include the eco-labelling and eco-management and audit schemes (EMAS), and the environmental management system standards ISO 14001 at international level. Both EMAS and ISO 14001 are products of a shift towards voluntary instruments and the standardisation of environmental management systems (Netherhood, 1998). These shifts reflect one aspect of the response by governments, regulators and business to society's concern over the standard of environmental performance and environmental protection by business organisations. Examples of environmental charters and industry codes of practice include the CERES Principles, the ICC Business Charter for Sustainable Development and the chemical industry's Responsible Care Programme. At present, the trend is for laws and regulations within the European Union to become more rigorous, both in relation to the level of emissions permitted and the scope of controls, resulting in a tightening of the scope of liability and the stringency of enforcement (Ledgerwood, 1997a). From a business perspective, there is also a growing recognition that ecological and social interests are business' interests. Consumers, competitors, employees, environmental organisations, the media, governments, the public, and academics are making increasing demands on corporate management, who must systematically search for a way of meeting these demands (Welford, 1997).

1.2. "Greening" in business organisations

The term, "green" or "greening", is becoming increasingly common in the business and management literature, but remains ambiguous in the research context. For example, issues such as green politics, green legislation, and green consumerism have been introduced. But while there are currently many corporate greening practices, such as clean production and life cycle assessment, there is no agreed definition of what "green" is. While there may never be a definition of what constitutes the perfectly green firm, the present lack of a definition may be due to uncertainty in understanding green behaviour. As Miller and Szekely (1995) point out, the term "green" may seem to be easily grasped and understood, but it is one that apparently most people find difficult to define with precision (p.322). In a similar vein, Meriläinet *et al.* (2000) found that an understanding of corporate greening can be limited without an understanding of green issues. Similarly, Levy (1997) argues that environmental management at best only enhances corporate responsiveness to regulatory and market pressures because it contains no mechanisms of understanding. Levy (1997) suggests that some firms seem to be ready to devote considerable resources to shape the meaning of green to suit their own interests, which mostly encourages a focus on factors that can be easily manipulated.

The Concise Oxford Dictionary (1998) provides the following broad definition of greening as "the process of becoming or making aware of or sensitive to ecological issues" (p.596). But, as Kleiner (1991) notes, "managers share no common understanding of what this might mean in their own companies" (Kleiner, 1991, p.38). The situation is similar in academia. For example, corporate greening is considered in terms as varied as technology and competencies (Hart, 1995), regulatory stance or response (Roome, 1992), and strategy (Esty and Porter, 1998).

In organisation study, Goerge and Füssel (2000) view greening as "a sense-making process, in which the organisational members' individual and collective identity is gradually transformed" (p.175). Similarly, Miller and Szekely (1995) have attempted to define what green is. According to them, "green is a concept that has been used by many people across all sectors of society in a very loose manner. People who are concerned about the health of the planet have used and misused the label "green" to describe any action, company, product, service, and attitude that damages the environment relatively less than prevailing practices" (p.322).

In the current research, the term "green" or "greening" is used as a label that differentiates these greening-related problems from those more general issues which are grouped under the label of the "business environment". Although the term "environment" is often used within the business literature, it is narrowly defined and often restricted to a discussion of organisation or business-context based issues (McCloskey and Smith, 1995). The meaning of "environment" in business study indicates the more general environment including financial, market or political environment. This research, however, uses "environment" as "ecological environment". In other words, ecological environment means “green environment” in the study. In order to provide an operational definition, corporate greening can be characterised as the effective integration of ecological considerations with the process of strategic decision making. In general terms, ecological considerations are factors, criteria, variables, or values having to do with the patterns of relationships between human beings and their physical environment. The concern in this research is with the quality of environmental resources such as air, water and land as components of ecological systems.

Thus defining the precise meaning of greening will not be attempted because the meaning may differ in different contexts. But, greening in this research context is taken to mean a widely used, multi-faceted term for perceived organisational level changes in practices which are characterised by improved relationships to the natural environment.

1.3. Contribution of the Research

1.3.1. Theoretical Contribution

Developing a concept of green environmental uncertainty adds new perspectives to organisational environmental uncertainty theories. Traditionally, environmental uncertainty theories adopted a resource-based view and green environmental issues were not included in the organisation’s resources. Probably the reason is that green environment has been considered as a free good (e.g. air, water, sunlight). Thus, decision-makers have paid little attention to the green environment. However, increasing pressures from legislation, stakeholders and competitors regarding green environmental issues now influence many aspects of business organisation. Therefore, green environmental uncertainty contributes to existing environmental uncertainty theories to include green issues among the factors which cause uncertainty.

Including green environment as a part of organisational environment also gives a different insight to top executives' commitment. That is, top executives demonstrate different levels of commitment when they perceive uncertainty with regards to green environment. These different levels of commitment would also lead to different types of corporate environmental strategy. Thus, identifying the link between top executives and their impact on corporate environmental strategy contributes to an understanding of strategic management.

1.3.2. Methodological Contribution

Applying Miles and Snow's (1978) environmental uncertainty scale, a more extensive green environmental uncertainty scale is developed. In order to develop the scale, green environmental uncertainty is defined as a decision maker's perceived inability to predict accurately what the green attributes related outcomes of a decision might be. Green attributes include government environmental policy, environmental resources and services, green products and markets, green competition, green technology and green stakeholders. This definition brings certain benefits such as operational meaning of "green" in business context to our understandings of environmental uncertainty.

Applying three different research methods, the questionnaire survey, the interview and the case study, it is possible to obtain rich explanatory and descriptive data.

1.4. Research Issue for Investigation

The focus of this research monograph is on the strategic management of corporate environmental management issues. As Ledgerwood (1997b, p.194) has argued, "For the first time, the globe is united in holding responsible for environmental performance the most powerful economic institutions: the major corporations. Strategic awareness within these companies is only now beginning to embrace this process". Building a strategic capacity to respond to emerging "green" challenges would involve obtaining better understanding of top managers' perception of risk and opportunity. At board level, corporate executives can level up of corporate greening behaviour from reactive or proactive stage.

During the last two decades, it is observed that firms changed from fighting and resisting environmental legislation to adopting a more proactive and positive approach to the "green" environment (Howes *et al.*, 1997). In particular, the chemical industry has been highlighted because of a number of major environmental accidents such as Union Carbide plant in Bophal, India in 1984 and a chemical spill into the Rhine following a fire at a Sandoz plant in 1986. As a result, the government, the non-governmental organisations (NGOs), and the media captured the public demand for corporate environmental accountability and responsibility in the chemical industry. The chemical industry's Responsible Care Programme leans heavily on the concept of a "license to operate" in the eyes of society at large. In the Republic of Korea, the Responsible Care Programme brought much attention to corporate environmental management in the chemical industry. Thus, the empirical context of this research is the Korean chemical industry.

In particular, this research is inspired by Gladwin *et al.* (1995) and Hart (1996). Gladwin *et al.* (1995) ask management researchers to answer why mainstream management and economics ignore the crisis of ecological and social deterioration. Similarly, Hart (1996) points out that there is a serious omission in management theory. It "systematically ignores the constraints imposed by the biophysical (natural) environment. Historically, management theory has used a narrow and parochial concept of environment that emphasizes political, economic, social, and technological aspects to the virtual exclusion of the natural environment. Given the growing magnitude of ecological problems, however, this omission has rendered existing theory inadequate as a basis for identifying important emerging sources of competitive advantage" (p.987).

In the current research, the greening of corporations is viewed as an outcome of strategic choice which top executives exercise over green issues. Although corporate response models based on a stages approach which ranges between reactive and proactive, have been developed in corporate environmental management literature, little research on strategic management and organisational theory has been conducted. One of the earliest and most systematic studies in strategic management and organisational study is the Miles and Snow (1978). Miles and Snow (1978) argue that top managers' strategic choices formulate corporate response models to external organisational environments. They provide four typology of corporate response model: prospector, analyser, defender and reactor. The current research focuses on the "greening" of Miles and Snow's (1978) reactor-defender-analyser-prospector model.

Thus this research aims to understand green issues in strategic decision making at board level. Since strategic decisions are made at board level, this research targets executives' perception and understanding on green issues. Achieving this objective may bring the outcomes of identifying factors which influence decision makers. In addition, increased understanding and knowledge of corporate environmental management is expected.

1.5. Overview of the Thesis

In chapter two, the current debate on sustainable development is explored. In particular, strong and weak sustainable development is discussed. Then, current academic research in business organisations and environmental issues is discussed. Chapter three reviews the literature on corporate organisational issues. This includes an open systems view of business organisation, external environment, business strategy and classification, top management environmental commitment, strategic dichotomy of opportunity and threat, organisational response and strategic management, and corporate greening response. Chapter four gives an overview of corporate environmental management (CEM). Since CEM is relevant to the development of a research instrument, a further ten different aspects of corporate environmental management are covered and discussed.

In chapter five, a general background of the Korean chemical industry is set out. This chapter gives detailed industrial data and notes particular challenging issues for the chemical industry. A previous empirical survey that was conducted by the author is included for better understanding of green issues in Korean industry. In addition, the Responsible Care Programme is discussed at international and the nation of Korea level.

Chapter six describes the research methodology. This chapter includes research methods, with the reasons why the chosen research methods are employed. More detailed descriptions of research tools which are chosen are added.

Chapter seven gives the survey data analysis and findings. The statistical computer software SPSS 9.0 Window version is used for the analysis. This chapter gives empirical evidence for quantitative analysis. Qualitative data analysis is discussed in chapter 8. This chapter gives a more in-depth explanation of executives' views on environmental issues and strategic concerns. Chapter nine describes case studies and their analysis. Based upon qualitative data, an evaluation sheet with scoring system is designed for quantification of qualitative data. Quantifying fifteen cases gives a categorical picture to analyse. Based on cluster analysis, four categorical types are identified.

The discussion in chapter ten develops the findings of the questionnaire survey, the interviews and the case study. During the discussion, more detailed findings are drawn.

Chapter eleven provides concluding remarks and research implications.

There are five major parts to this thesis. The first part, covered by Chapters 2, 3 and 4, reviews the pertinent literature and identifies the theoretical framework for the research. The second part, Chapter 5, provides the general background of Korean industry, and in particular the chemical industry. The third part, Chapter 6, describes research methods which are employed in this research. The fourth part, Chapters 7, 8 and 9, presents the research results. The fifth part, Chapters 10 and 11 provides discussion and conclusions. More specifically, this introductory chapter has set out the background to the research, the meaning of greening in business organisations, the main contribution of the research, the research question and the general structure of the thesis.

Chapter Two
Sustainable Development

2.1. Introduction

This chapter explores the debate around the concept of sustainable development. From the literature on the concept, two broad perspectives can be distinguished that describe sustainable development and its implications for business. These are weak and strong sustainable development. Weak sustainable development is based on the current conventional economic and techno-centric paradigm. In comparison, strong sustainable development is a more eco-centric than techno-centric perspective. Therefore, the view of sustainable development varies. The business community tends to accept weak sustainable development and a techno-centric view. One of leading business groups, World Business Council for Sustainable Development (WBCSD) supports this view. Among academics, for example, Porter (1991, 1995) supports this view. Porter claims that stricter environmental regulations will offer the opportunities which companies can take for early mover advantage by investing in environmental technology. Walley and Whitehead (1993), for example, believe that Porter's claim is based upon only "successful" cases. They find that there are more "failed" cases than "successful" ones. At present, there is no clear solution into this debate between Porter and Walley and Whitehead. It is still an ongoing debate in academia. The following sections elaborate these ideas in more detail.

2.2. The sustainable development debate and its implications for the business community

The publication of the Brundtland Report in 1987 (WCED, 1987) brought social and environmental issues to the top of the political agenda. The United Nations Conference on Environment and Development in Rio de Janeiro, Brazil in 1992 continued the profile of such issues in a global context. More than 150 countries agreed to establish a number of blueprints, principles and legally binding conventions. More recently, global warming and climate change issues as part of the UN Framework convention on Climate Change were discussed in December 1997 in Kyoto, Japan. Reduction targets of the six main global warming gases by an average of 5.2% over the years 2008 to 2012 were agreed. However, in terms of using different principles and tools to reduce global warming, the difficulties of obtaining global agreement meant that the international community ultimately failed to gain a treaty on global warming in The Hague, Netherlands in December 2000. More recently, the Unites States' broke the Kyoto agreement on global warming in 2001. Sustainable development and sustainability[3] have become subjects of whether "free market" societies of the developed world can deliver a "sustainable economy". From an ecological perspective, this means living within the carrying capacity of the planet and doing our best to protect and preserve what remains of the earth's ecological capital.

2.2.1. Sustainable development: Economic Perspectives

The core idea of sustainable development was most influentially defined by the *Brundtland Report* in 1987 (WCED) as that "which meets the needs of the present without compromising the ability of future generations to meet their own needs. (p.8)".

[3] The terms "sustainable development" and "sustainability" are often used interchangeably, suggesting that they are one and the same.

Brundtland argued that sustainable development requires the promotion of values that encourage consumption patterns that are within the bounds of the ecologically possible and to which all can reasonably aspire. Second, there is the concept of limitations on the environment's ability to meet present and future needs, limitations that are imposed by the state of technology and social organisation.

However, the variety of approaches to sustainable development are an indication of differing ideological beliefs about the natural world, which for simplicity can be divided into the "techno-centric" and "eco-centric" approaches (Baker *et al.*, 1997). In the techno-centric approach, at least in its extreme form, economic behaviour is viewed in terms of the forces of industrial, economic and technological improvement. In contrast, the eco-centric approach espouses "appropriate" technology; that is, technology that is in keeping with natural laws, small in scale, understandable to lay people and workable and maintainable by local resources and labour. This distinction corresponds to two categories of sustainable development: weak and strong sustainable development.

2.2.1.1. Weak Sustainable Development

Weak sustainable development aims to integrate capitalist growth with environmental concerns. This position is backed by Pearce *et al.* (1989) who argued that the principles of neo-classical economics can be applied to the solution of environmental problems. The objective of policies to promote weak sustainable development remains economic growth, but environmental costs are taken into consideration. They see this as feasible because the environment is considered to be a measurable resource (Pearce *et al.*, 1989).

Weak sustainable development has had a growing influence on international institutions including the World Bank and the United Nations. According to Redclift and Goodman (1991), weak sustainable development has become almost synonymous with environmental management in business. It is closely linked with a techno-centric view of nature, wherein nature is seen as providing both material and environmental wealth.

However, many are critical of this approach. For example, Schumacher (1973) challenged conventional methods of mass production and mass consumption. He found many negative aspects to large-scale enterprise and many virtues in small-scale individual enterprise. Meadows *et al.* (1972) countered conventional techno-centric, neo-classical economic paradigms with particular regard to their assumptions of infinite resources and unlimited growth. Boulding's (1964) well-known distinction between "cowboy economy" and "space ship economy" is also relevant. Georgescu-Roegen (1971) and Daly and Cobb (1989) point out that mainstream economists, in particular neo-classical economists and the business community, ignore the limits of growth. These critiques are rather pessimistic about the carrying capacity of the earth.

In contrast, Kahn *et al.* (1976) and Beckerman (1974, 1995) defend the position that the earth is resourceful in relation to technological growth and that "small is stupid". Many mainstream economists and the business community agree with this position. In effect, they believe the limits to growth to be non-existent. They also believe that free markets and technological development can solve all remaining problems.

2.2.1.2. Strong sustainable development

Whereas Pearce *et al.* (1989) assert that economic development is a precondition of environmental protection, advocates of strong sustainable development assert that environmental protection is a precondition of economic development. This, as *Brundtland* argues, involves a different kind of economic development which is more focused on the environmental dimension than has been the case in the past. This position requires that political and economic policies be geared to maintaining the productive capacity of environmental assets, and to protecting and creating environmental assets. This will require market regulation and state intervention using a wide range of tools and mechanisms. Thus ecologists view ecological systems as critical for the overall stability of the global ecosystem. Since they view natural resources not as "free goods" and unlimited growth is not possible either, they derive two fundamental principles. First, human economic activity is a subsystem of larger and finite ecosystem. Second, as the current economic growth paradigm and growing human populations use increasing amounts of natural resources and produce increasing volumes of waste, the carrying capacity[4] of ecosystems is being exceeded. Finally, sociologists emphasise that the key actors are human beings, whose patterns of social organisation are crucial for devising viable solutions to achieving sustainable development. Their views also support the *Brundtland Report* which indicates the modern development process fails to meet human needs and often destroys or degrades the resource base. Table 2.1 compares the two views of sustainable development.

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[4] "The concept of carrying capacity is fundamental to an understanding of the relationship between humans and the natural environment. Carrying capacity refers to the population that a given ecology can support. The main factors in determining carrying capacity are levels of population, patterns of resource demand, environmental yield potential and resource flows, and environmental absorption capacity and impacts." (Clayton and Redcliffe, 1996, p.89).

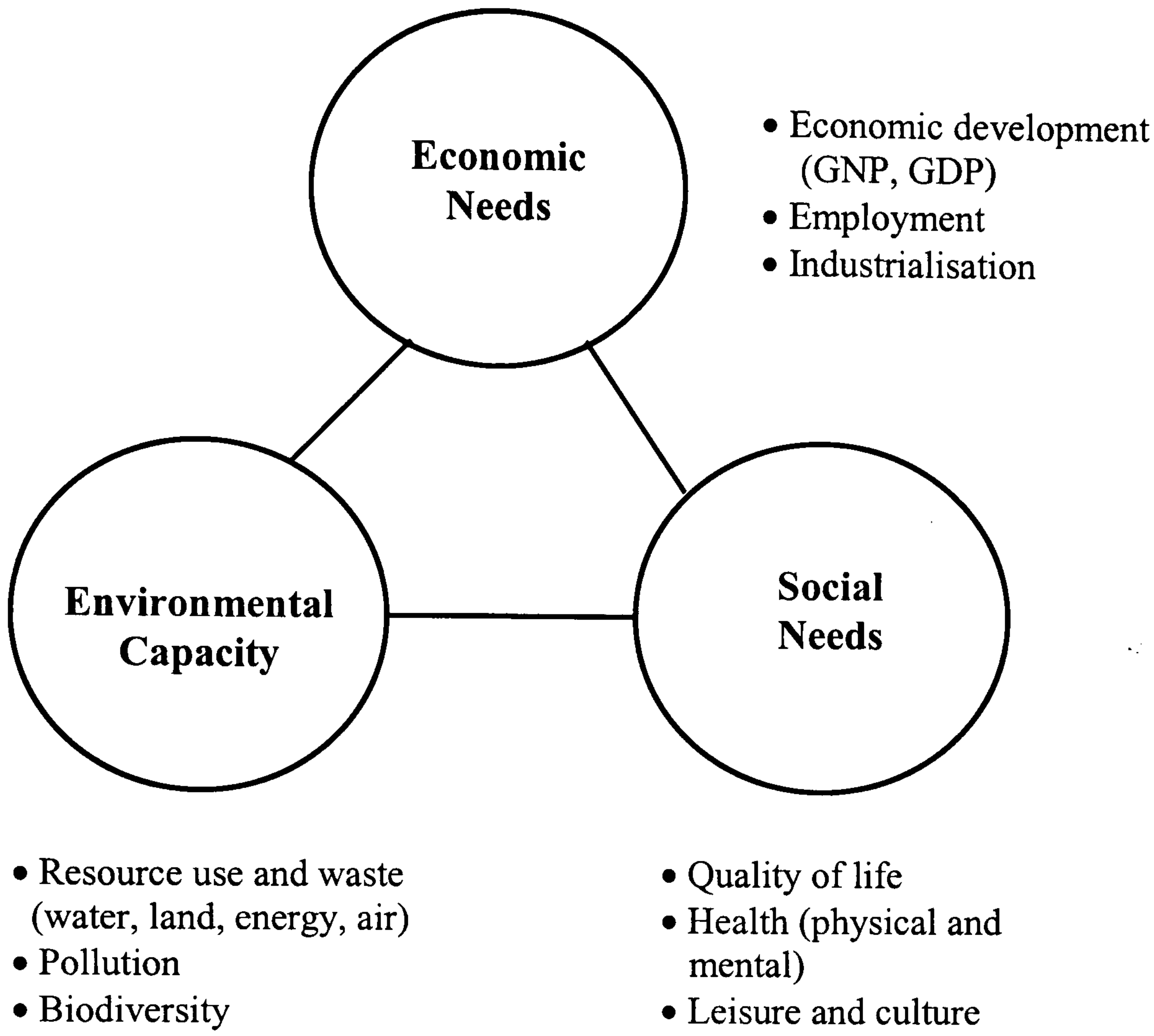
Table 2.1. Strong and Weak Sustainable Development

Criteria	*Strong Sustainable Development*	*Weak Sustainable Development*
Role of economy and nature of growth	Environmentally regulated market; changes in patterns of production and consumption	Market-reliant environmental policy; changes in patterns of consumption
Geographical focus	Heightened local economic self-sufficiency, promoted in the context of global markets	Initial moves to local economic self-sufficiency; minor initiatives to alleviate the power of global markets
Nature	Environmental management and protection	Replacing finite resources with capital; exploitation of renewable resources
Policies and sectoral integration	Environmental policy integration across sectors	Sector-driven approach
Technology	Clean technology; product life-cycle management; mixed labour-and capita intensive technology	End-of-pipe technical solutions; mixed labour- and capital-intensive technology
Institutions	Some restructuring of institutions	Minimal amendments to institutions
Policy instruments and tools	Advanced use of sustainability indicators; wide range of policy tools	Token use of environmental indicators; limited range of market-led policy tools
Redistribution	Strengthened redistribution policy	Equity a marginal issue
Civil society	Open-ended dialogue and envisioning	Top-down initiatives; limited state-environmental movements dialogue
Philosophy	Eco-centric	Techno-centric

[Source: Baker *et al.*, 1997]

Since the *Brundtland Report* published, The World Bank (Serageldin and Steer, 1994; Serageldin, 1995) attempted to provide its view of sustainable development. They took three different perspectives: economic, ecological and sociological (Figure 2.1). According to them, conventional economics seeks to maximise net human welfare within the constraints of existing capital stocks and technologies.

Figure 2.1. Three Dimensions of Sustainable Development



This approach is supporting weak sustainable development as explained earlier. The World Bank (1994) points out that each perspective should be integrated to capture the definition by Brundtland and achieve sustainable development. More importantly, current thresholds and uncertainty can be explained and predicted better in an integrated perspective than in each different perspective. Pearce (1993), for example, presented a possible map of the sustainable transition in four contexts: policy, economy, society and discourse. He attempted to integrate four different contexts under the definition of sustainability, and provided more detailed transition stages of sustainability from ultra weak to strong sustainability.

2.3. Sustainable Development and the Business Community

Environmental issues have been considered as a key aspect of sustainable development in the business community. The term "sustainable development" catalyses debate over the relationship between economic change and the natural-resource base. The term suggests that the lessons of ecology can, and should, be applied to economic processes. It encompasses the idea of providing an environmental rationale through which the claims of development to improve the quality of life can be challenged and tested. To what extent though does sustainable development provide an alternative paradigm, or system of meaning, as well as a focus for improving environmental policy and management?

A business view of the environment corresponds with what O'Riordan (1981) has termed a "techno-centric" rather than an "eco-centric" perspective. The assumption is that an optimum balance of uses can be found, which can combine productivity with conservation goals. For example, using trees in pulp and paper industry with replanting new trees at same area which obtained trees for the industry will bring no harmful impact on optimum natural resource balance. However, the industry seems to ignore environmental problems which are caused by processing and treating trees and pulps. Processing trees and papers causes harmful chemical wastes and effluents. Thus, the techno-centric view of sustainability in the pulp and paper industry is not easily justifiable.

In the techno-centric view of sustainable development in the business community, environmental considerations can be closely related to the choice of a technological option. Environmental issues can be considered in the choice of a technological option, but they are not the principal consideration (Hosier *et al.*, 1982). Instead, environmental issues are considered as constraints rather than choices because constraints are the material co-ordinate within which choices can be taken (Hosier *et al.*, 1982, p.180). Similarly, Gligo (1985) notes that most technologies are used in combination, not on their own. Technological options (combinations) are chosen to meet specific development objectives. Therefore, the environmental issue is considered as a part of technological issues rather than a strategically important issue.

Blaikie (1985) provides a critique of current environmental debates in the business community. First, he suggests, it is impossible to arrive at the optimum mix of resource use without preconceived, value-based criteria. Second, most environmental issues in corporations are corrective, rather than directive. Corrective interventions are most successful when they prevent something from happening, but this also makes them difficult to evaluate. Finally, environmental problems have characteristics which make for relatively facile diagnosis but difficult solutions. It is much easier to establish what has happened than why it has happened, because of the complexity of variables at work in establishing causation, the relevant time horizons and the correct environmental parameters. For all these reasons environmental management is not only often unable to initiate radical action, it is also unable to make much impact on the problems that exist. It is still concerned with "techniques rather than policies" (Blaikie, 1985).

In a similar vein, Norgaard (1985) points out that traditional environmental knowledge is not only devalued by development institutions, it is also largely overlooked in the environmental management literature. Redcliff (1992) supports this view. According to him, the problem in achieving sustainable development is related to the overriding structures of the international economic systems, which themselves arose out of the exploitation of environmental resources, and which frequently operate as constraints on the achievement of long-term sustainable practices. Neither neo-classical nor traditional radical (such as Marxist) economics take sufficient account of the environment, while environmentalist positions provide only the vaguest guidelines for negotiating a more constructive relationship with nature.

In summary, business communities are facing national and international pressures in terms of environmental and economic aspects regarding sustainable development. The concept of weak sustainable development provides a more applicable approach to many business communities even though strong sustainable development is desirable ideally. With the idea of weak sustainable development, traditional environmental management has focused on techniques or tools to check or reduce environmental impacts. Although these techniques are useful, they become difficult to use for decision-making or policy because of their short-term characteristics. Therefore, it is necessary to consider a more long-term point of view in environmental management. The long-term consideration of economic, social and environmental dimensions may contribute to achieving sustainable development in our society.

2.4. Current Academic Research into Business Organisation and the Natural Environment

2.4.1. Macro View: Business and the Natural Environment

As a result of a growing sensitivity to the impact of pollution on the human and natural environment, popular opinion has become increasingly galvanised. In the 1990s, *The Economist* (1990) surveyed the public's view on the natural environment in the US and the UK. When the question, "do you agree that protecting the environment in the United States is so important that requirements and standards cannot be too high?", was asked between 1981 and 1990, just over 40% of Americans agreed in 1981 while over 70% of Americans expressed the same opinion to the question in 1990. In Britain, the same survey in 1990 found that 30% agree that "the environment is one of the most important issues facing Britain." A similar survey by the OECD (1991) found the following proportions of respondents favoured protecting the environment at the expense of economic growth: U.S.-71%; Finland-63%; EEC-55%; Norway-48%; Japan-36%.

Looking at the country that is to be the focus of the present study, Korea experienced dramatic changes in energy consumption stemming from rapid economic development between 1961 and 1995. During this period, Korea shifted in common perception from a non-industrialised nation to one that would soon accede to membership in the Organization of Economic Co-operation and Development (OECD). Choi (1997) studied total CO_2 emissions from fossil-fuel consumption in Korea. During the period 1961-1995, the country's energy consumption pattern changed dramatically. For example, the residential and commercial (R&C) CO_2 emissions component - more than 80% in 1961 - declined to less than 25% in 1994, while the industry component - less than 30% in 1961 - increased to more than 60% in 1994. One of the main sources of change in CO_2 intensity is the aggregate emission coefficient and this contributed to CO_2 intensity more than did energy intensity, emphasising the significant role of energy substitution in reducing CO_2 emission in the economy (Choi, 1997). Table 2.2 shows the level of pollution in different OECD countries. Compared to Japan, Korea has relatively higher air pollution level in sulphur oxides and nitrogen oxides which directly and indirectly resulted from the chemical industry.

Table 2.2. Pollution Level of Air and Waste in selected OECD countries

Country	Air			Waste		
	Sulphur Oxides kg Per Capita	Nitrogen Oxides kg Per Capita	Carbon Dioxide tonnes per Capita*	Industrial Wastes per unit of GDP Tonnes per million $	Municipal Waste kg per Capita	Nuclear waste per unit of Energy tonnes per Mtoe**
Canada	91	68	16	N/A	630	7.4
Finland	22	54	12	201	410	2.2
France	17	26	6	100	560	5.1
Germany	37	27	11	60	360	1.4
Japan	7	12	9	61	410	1.9
Korea	34	26	7	67	390	1.8
Norway	8	51	8	39	620	-
Portugal	27	26	5	N/A	350	-
Spain	53	31	6	28	370	1.6
Sweden	11	45	6	95	440	4.8
United Kingdom	47	38	10	59	350	5.2
United States	63	74	20	142	730	1.2

-: nil or negligible.

*: CO_2 from energy use only; international bunkers excluded.

**: Wastes from spent fuel in nuclear power plants, in tonnes of heavy metal per million tonnes of oil equivalent (primary energy supply); Mtoe (Million tonnes of oil equivalent).

Source: OECD Environmental Data, Compendium 1997, OECD, Paris.

Pollution control standards have generally tightened in most countries that already had them, and have been instituted in many countries that did not already have them. By 1987 seven European nations had elevated an environment minister to cabinet level (*The Economist*, 1987). More recently, the Kyoto protocol catalysed global movement to reduce emissions since 1997 (Table 2.3).

Table 2.3. National emission trends, Kyoto objectives and EU burden-sharing

	1990 GHG emissions (million tonnes CO_2 equivalent)	Percentage change 1990-1995	Kyoto target for 2008-2012 (as a % of 1990)
Non-EU OECD			
Australia	406	6	8
Canada	558	10	-6
Japan	1190	8	-6
New Zealand	76	0	0
Norway	49	6	1
United States	5713	5	-7
European Union			-8.0
EU Burden-sharing targets			
Austria	78	1	-13.0
Belgium	139	6	-7.5
Denmark	72	10	-21.0
Finland	65	3	0.0
France	498	0	0.0
Germany	1204	-12	-21.0
Greece	99	6	25.0
Ireland	57	4	13.0
Italy	532	2	-6.5
Luxembourg	13	-24	-28.0
Netherlands	207	8	-6.0
Portugal	68	6	27.0
Spain	301	2	15.0
Sweden	65	3	4.0
United Kingdom	715	-9	-12.5

Source: Grubb *et al.* (1999) The Royal Institute of International Affairs, London.
Committed percentages are assigned to the amount of carbon stocks during the period 2008 to 2012 resulting from direct human induced activities of afforestation, reforestation and deforestation since 1 January 1990.

For example, British Petroleum (BP) responded positively to the Kyoto protocol in 1998. BP set a goal of reducing its own greenhouse gas emissions by 10% by 2005. Similarly, Royal Dutch/Shell announced that its reduction target is 10% by 2002. And in the UK, the oil and gas company Amerada Hess started marketing "zero carbon" gas in British gas markets. On this basis, the Carbon Trust aims to work with the oil companies to install "zero carbon[5]" petrol at Britain's filling stations. Recently, Cambridge University in Britain awarded European Union Research Fund for "zero carbon" public transport scheme. The scheme uses solar energy to convert water into hydrogen which will then power a specially designed bus. The only emissions will be water vapour, oxygen and heat (Financial Times, 2nd October 2001).

The term "zero carbon" or "green fuel" began being used as a marketing tool at petroleum stations. More recently, fuel cell for zero-emission vehicles are introduced in automobile markets. According to California Institute of Technology[6], methanol converts the chemical energy of its fuel directly into electricity without burning the fuel. They argue that using methanol as the base fuel mixed with water is more efficient and less wasteful. Even California in the United States is leading the way in search of the "zero emissions" vehicle. Also, carmakers in the United States such as Ford, General Motors, Toyota and DaimlerChrysler applied fuel cell technology for their smart car series to surpass federal emission requirements. However, it is noted that current technology can reduce the carbon dioxide emissions by one-third (World Resource Institute, 2001). Thus, the terms "zero carbon" and "zero emissions" are considered unrealistic with currently available technology even though it is useful for clean air and the environment (Science, 1995; World Resource Institute, 2001).

[5] Zero carbon being used here is the petroleum which contains reduced percentage of lead up to 30%.

[6] Accessed http://techtransfer.jpl.nasa.gov/success/stories/fuelcel3.htm, on 12th February 2001.

2.4.2. Environmental Economics and Environmental Regulation

Much of the work in environmental economics has focused on the impact of pollution control regulations on performance. Academics working in environmental regulation (e.g., Oats *et al.*, 1989) recognise that regulation has both direct and indirect effects on the firm (Maloney and MoCormick, 1981; Oats *et al.*, 1989). The direct effect proposed involves a decrease in productivity as a result of compliance with regulations. The decrease is caused by a forced investment in non-productive capital and labour to abate pollution, with no offsetting increase in output. It is this negative direct effect that forms the basis for the conventional wisdom regarding firm performance and pollution-reducing investments.

Although environmental economists in general recognise that there are social benefits to pollution control, these benefits are deemed difficult to measure and so are generally assumed away[7] (Smith and Sims, 1985).

However, it is possible to criticise this approach. The direct effects argument is based upon a simplified view of the world, resulting in an overly-constrained economic model. Such a model provides insights into basic interactions in the real world, but must be relinquished when they are no longer relevant. The critical simplifying assumptions of the direct effects in environmental economics are:

- Firms in an industry all face the same input costs

[7] Cost and benefit analysis (CBA), for example, used to government projects such as motorway project, channel tunnel or road bridges in the United Kingdom. The main aim is to ensure that benefits must exceed costs in selected projects. However, there are critiques about using CBA for environmental evaluations. For example, market failure leads to an incorrect set of prices which inaccurately measure marginal social costs and benefits. If these measures cannot be observed accurately, then mistakes will be made in the allocation of resources, resulting in efficiency losses (Hanley and Spash, 1993). In a similar vein, Norgaard (1989) noted, if individuals are poorly informed or unable to comprehend either future or present environmental effects of economic actions, then stated or revealed preferences are a poor guide to policy such as on global warming.

- Enforcement of regulations is uniform across firms
- Pollution-reducing investments are cost inputs with no cost-saving or output-increasing capabilities
- New technology is available instantaneously and cost-free to all
- Management has nothing to contribute

These assumptions are criticised by other scholars in economics and the sciences. For example, Daly (1973) in *Toward a Steady-State Economy*, and Daly and Cobb (1989) in *For the Common Good*, suggest that there is a finite carrying capacity to economic growth on our planet. According to them, economic activity is the most polluting of all forms of human activity and the planet has a finite capacity to absorb pollution. Thus, planet-based human economic activity has a finite limit. Similarly, Boulding's (1968) classic essay *The Economics of the Coming Spaceship Earth* received much attention internationally. In this book, he distinguished the Cowboy and Spaceship economies. The cowboys in earlier western frontier societies lived in a world of inexhaustible material resources. In contrast, astronauts live on spaceships hurtling through space with a precious and limited supply of resources. Everything must be maintained in balance, recycled and nothing can be wasted. Boulding (1968) suggests that our problem results from acting like cowboys on a limitless open frontier when in truth we inhabit a living spaceship with a finely balanced life-support system. Currently modern society is practicing a cowboy economics in what has become a spaceship world. We still treat nature's bounty and waste disposal capacity as free for the taking.

Among the assumptions of the direct effects in environmental economics, the assumption of pollution-reducing investment without cost-saving is tested by researchers. Conrad and Morrison (1989) find a positive relationship between productivity and investment in pollution control assets. In contrast, Bartel and Thomas (1987) find a negative relationship between environmental regulations and industry profitability. Although there is much literature on statistically significant negative associations between environmental regulation and performance, the premises may be flawed; in many instances the economic significance of the negative relationship is small, and certain industries and firms may actually benefit from environmental regulation and international standards. Michael Porter of Harvard Business School proposes that stricter environmental regulation will bring early mover advantage to certain industries or firms if they invest in environmental technologies and other relevant business activities before competitors. Porter and van der Linde (1995) also find a number of positive cases which support the "Porter hypothesis".

In industrial organisation economics, early mover advantage may be gained when the firm is reasonably certain of future demand and can itself occupy a key position in supplying that demand by pre-emptive investment (Porter, 1980; Teece, 1987). For example, Charnovitz (1993) accepts that there are two conventional pressures to achieving competitiveness caused by environmental regulation or policy. First, increasing cost because environmental regulations may mean domestic markets being lost to foreign competition. Second, as a result of losing markets or investment, governments may face political pressure to lower their level of internal regulation. However, gaining early mover advantage means increased competitiveness at industry or country level. Charnovitz (1993) defines competitiveness as the ability of an industry or country to produce goods and services that meet the test of international markets while its citizens earn a standard of living that is both rising and sustainable over the long run. In order to gain competitiveness, increased efficiency by using lower resource inputs and pollution prevention rather than end-of-pipe approach can make for lower long-run remediation costs.

2.4.3. Early Mover Advantage by Pre-empting Legislation

Firms can also lower costs by pre-empting legislation. If they are able to forecast changes to legislation during the life span of new capital equipment, they can deter costly capital refits. This issue is particularly important for companies with heavy capital investments such as chemical or heavy oil industry.

Pre-empting legislation is not only important for new capital investment, but it is critical in the purchase of land. Governments are increasingly applying the polluter-pays principle through such legislation as the US Superfund. The British government is considering seriously the imposition of a Contaminated Lands Register. If enacted, the polluting firm would be responsible for land remediation well after the sale of the land. Firms which anticipate these changes in advance would install pollution prevention techniques and monitor spillages in order to avoid such stifling remediation expenses.

Anticipating legislation not only allows firms to lower costs, it permits them to spot attractive industries for new business development. For example, the structure of some industries is changing quite dramatically because of new barriers to exit and entry through environmental legislation. In the case of Germany's waste management legislation, for example, German firms now enjoy a more protectionist environment. Strict packaging standards and the need to offer after-use facilities for the collection and recycling of waste have erected a barrier to trade.

As discussed above, the environmental and economic "win-win" scenario has been applied in relation to business environmental strategies and regulatory policies. However, to rely on measures which business would regard as "win-win" to deliver necessary environmental improvements would be simply naïve. Remaining competitive and delivering value for shareholders still remains the central goal of the complex commercial organisations within which concerned individuals work (Walley and Whitehead, 1993). Following sections explore more detailed for "win-win" scenario in businesses.

2.4.4. Empirical Literature on International Business and the Environment

Conventional economists have argued that environmental investment and expenditure would cause loss of industry competitiveness. Medhurst (1993, p.39), for example, found that the scope for significant changes in international competitiveness attributable to environmental pressures (e.g. investment on pollution reduction, environmental technology, increased costs because of those early investments) is relatively small. Based upon his comparative study between developed and less developed OECD countries, he argued that there is no evidence that less developed OECD countries have secured competitive advantage from lower environmental costs. Table 2.4 shows created year of creation of national environmental protection agencies as an indication of environmental pressures in selected countries. For example, the Republic of Korea established environmental protection agency (EPA) in 1980, and relatively long history of EPA among selected countries. It indicates that regulatory environmental policy has become stricter since 1980 in the Korean context.

Table 2.4. Year of creation of National Environmental Protection Agencies in Selected Countries

Country	Year of Creation
Sweden	1967
USA	1970
Canada	1971
Japan	1971
France	1972
Norway	1972
Germany	1974
Korea	**1980**
Finland	1983
Italy	1986
Turkey	1988
Brazil	1990
Portugal	1990
Spain	1991

Sources: Each country's national governmental agency responsible for the natural environment

However, Dean (1992) found that there is no evidence to support the view that "more stringent regulations in one country result in loss of competitiveness". Similarly, Pearce (1992) concludes that there is no evidence that industrial competitiveness has been affected by environmental regulation. Both these researchers find that the location decision of firms is not significantly influenced by environmental regulation.

To sum up, there are rapidly growing environmental pressures on industries and companies. Currently economic and environmental issues are being highlighted in the macro view of business economics. Although there are ongoing debates on the "Porter hypothesis", it is clear that we need to respond to environmental issues, we cannot ignore environmental issues any more.

2.5. Sustainable Development, Eco-Efficiency and Business Organisations: Micro Business View of Sustainable Development

Many industries and firms view sustainable development as a new and unpredictable rearrangement of the preexisting elements (Shrivastava, 1995). This view is also found in *The New Fontana Dictionary of Modern Thought* (1999). It refers to management practices that are designed "to ensure that the exploitation of resources is conducted in a manner that protects the resource base for use by future generations (p.849)". Thus, the clear message is that many businesses perceive sustainable development as an emerging and challenging issue. How do they respond to the issue?

Bebbington and Gray (1996) point out that definitions of sustainability are far too general to be practicable. There is, nevertheless, a growing acceptance of the view that sustainability may usefully be seen as being comprised of a number of different elements which, when taken together, provide a more complete picture of the sustainable business community as a whole. One important element that has received widespread support is the recognition that economic and environmental benefits are associated with improved corporate environmental management and performance (Stone, 1994). In order to achieve this, the term, "eco-efficiency" is increasingly being used in the context of corporate environmental management. The World Business Council for Sustainable Development (WBCSD) defines eco-efficiency as maximising value while minimising resource use and adverse environmental impacts (WBCSD, 1996). Similarly, Stone (1994) stated, "eco-efficiency is concerned with increasing or maintaining output value with reduced inputs of resources and costs. Thus, it is essentially business-centred rather than environment-centred" (p.4).

One of the more contentious arguments is that only business can deliver sustainability. According to Hart (1997), "corporations are the only organisations with the resources, the technology, the global reach, and ultimately the motivation to achieve sustainability (p.69)."

Although the concept of eco-efficiency is desirable environmentally, there are doubts about economic benefits (Walley and Whitehead, 1993). Business executives still tend to view the natural environment as a cost assuming that spending money to improve environmental performance would hurt their competitiveness. Thus, advocates of eco-efficiency are confronted with a challenge: how to build a business case for their adoption? A well known example of the win-win scenario is 3M. Its Pollution Prevention Pays programme since its inception in 1975 has reduced carbon emissions by over one billion pounds (454, 000,000 kg) while saving the company more than $750 million. Despite anecdotal cases of win-win, persuading real-life businesses to pursue "win-win" remains difficult. Although "win-win" establishes a business rationale for pursuing environmental improvements, it does not ensure that recommendations will actually be implemented (Walley and Whitehead, 1993). For example, a survey by McKinsey & Co. (1991) points that only 13% of companies take an essentially strategic approach to environmental management. Similarly, Arthur D. Little (1995) found that 91% of environment, health and safety (EH&S) managers believe that significant obstacles were keeping their company from integrating EH&S management into business operations.

Meanwhile, eco-efficiency and win-win are reflected in the concept of the "socially responsible business (SRB)". This proposed a fundamental re-ordering of corporate values. Contrary to conventional economic ideas, which argue that the sole purpose of corporations is to create shareholder value, the SRB holds that economic value is not the only, or even the dominant, corporate *raison d'etre* (Frankel, 1998).

At the same time, there have been growing critiques of the basic concept of eco-efficiency. It has been argued that eco-efficiency failed to pose critical questions about the limitations imposed by underlying structural constraints, i.e. the degree to which corporate self-interest, as mandated by the current rules of market-economy capitalism, puts a cap on the extent to which companies actually can break with business-as-usual mentalities and conventional wisdom (Srivastava, 1992; Korten, 1995; Hawken *et al.*, 1999).

Since there is a strong belief that businesses won't move towards sustainability without economic benefits, there is a growing demand for evidence of the viability of the "win-win" strategy from executives. Their views are found in international surveys in following section on corporate greening trends.

2.6. Trends of Corporate Greening Awareness

According to a 1997 survey of Standard & Poor's 500 companies by the Investor Responsibility Research Centre (IRRC), 97% of large manufacturing companies have a formal, written environmental policy. Also 97% of S&P 500 companies conducted audits for environmental performance[8].

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[8] A 1994 Ernst & Young survey of Canadian companies found that 86% of audits were conducted primarily for compliance. According to the Ernst & Young survey, other reasons for conducting audits included: (1) helping to define potential risk areas (78%); (2) increasing management's awareness of environmental issues (67%); (3) protecting directors from potential liabilities (51%); and (4) measuring and tracking environmental management system performance (48%). Survey of Environmental Management in Canada, Ernst & Young, 1994.

According to a 1994 PriceWaterhouse survey, more than 40% of mid and large sized companies have elevated the overview of environmental compliance to the corporate board level. And for similar surveys conducted in 1990 and 1992, there is a clear trend toward formalizing environmental issues at board level. Similarly, a McKinsey & Co. survey in 1991 showed that 22% of respondents evaluated the environmental performance of suppliers. These surveys suggest that green issues are becoming important or at least gaining serious attention from executives. This may imply that executives are seeking environmental as well as positive economic benefits at the same time.

However, attitudes in North America are tempered by a measure of skepticism. Some business executives have adopted a wait-and-see approach, unpersuaded that the not insubstantial investment will produce an adequate payback (Walley and Whitehead, 1993; Hart, 1997).

To describe an imaginary corporation whose environmental attitudes and policies are representative of S&P 500 manufacturing companies, Ernst & Young, (1994) suggest that the typical company

- has made consistent progress in reducing spills and emissions.
- has an environmental mission statement, with the increasing likelihood that it has some real substance.
- conducts regular environmental audits (but for compliance, not for excellence).
- has an active TQEM programme.
- is seeking ISO 14000 registration.
- has recently implemented a programme evaluating suppliers' environmental performance, or is considering doing so.
- publishes an environmental report or has plans to do so.
- has an environmental awards programme and is also beginning to integrate eco-performance into its managers' compensation packages.

- is a signatory to one or more industry codes of environmental conduct.
- is pursuing eco-efficiency, at least to some degree.
- still treats environmental management as a cost centre.

The characteristics shown above imply that companies are trying to demonstrate what they are committed, but most of them still believe environmental issues are mainly cost rather than profit.

Hart (1997) notes that "few executives realise that environmental opportunities might actually become a major source of reengineering, or cost cutting. Rarely is greening linked to strategy or technology development, and as a result, most companies fail to recognise opportunities of potentially staggering proportions" (p.68). Historically, industry representatives have tended to favour a more limited definition, preferring to focus on what's quantifiable. However, it is difficult to define "green" opportunities or threats in quantitative term (Frankel, 1998).

The business philosophy that attempts to move one step closer towards sustainability has come generically to be known as *corporate environmental management* (CEM). The fundamental difference between traditional environmental management and CEM is one of attitude. Old-fashioned environmental management is essentially defensive: how can we stay out of trouble? In contrast, CEM has a much more proactive orientation: how can we use our environmental expertise to create competitive advantage? Its goal is to place environmental management on a strategic management basis. Thus, considering environmental issues in strategic management terms can identify new core competencies.

For example, Braungart and McDonough (1998) propose an aggressive re-definition of design for environment (DfE), and a lifting of its Do-it-Right-the-First-Time mentality beyond the relatively narrow confines of eco-efficiency and into the broad domain of sustainability. According to them, when waste is designed out of a process, you have advanced well beyond the "end-of-pipe" (compliance) and even "front-of-pipe" (eco-efficiency) approaches to environmental management.

2.7. Conclusion

The concept of sustainable development has been introduced in this chapter. Two different perspectives on sustainable development, eco-centric and techno-centric, dichotomize the concept in terms of strong and weak sustainability. Strong sustainability based upon eco-centric perspective was rooted more to deep green or ecologist community. The ecologists community views the human is a part of natural environment, and ought to comply with natural laws. Weak sustainability based upon the techno-centric perspective was oriented more to the business community. The business community such as WBCSD developed the idea of eco-efficiency as a response to the idea of sustainable development, more precisely weak sustainability. Achieving eco-efficiency can be cost saving or cost spending. Conventional economists (e.g. Oats *et al.*, 1989) insist that achieving environmental excellence will cost more without offsetting investment and output. In contrast, strategic management academics (e.g. Porter and van der Linde, 1995) assert that investing in environmental technology or complying with environmental regulation earlier than competitors will bring early mover advantage and, as a result, offset costs and produce cost-savings and profit. As several surveys concluded, achieving eco-efficiency is mainly dependent upon top executives' attitude. Once they recognise environmental opportunities, their companies could achieve the win-win scenario of eco-efficiency. Top executives' attitude and perception on environmental opportunities or threats can influence the activities of corporate environmental management. Taking into account perceived environmental opportunities or threats can bring different stages of corporate environmental strategy from reactive to proactive. Thus, top management commitment may affect to the level of strategic activities such as environmental scanning or environmental analysis in corporate environmental management.

Chapter Three

Corporate Organisation

3.1. Introduction

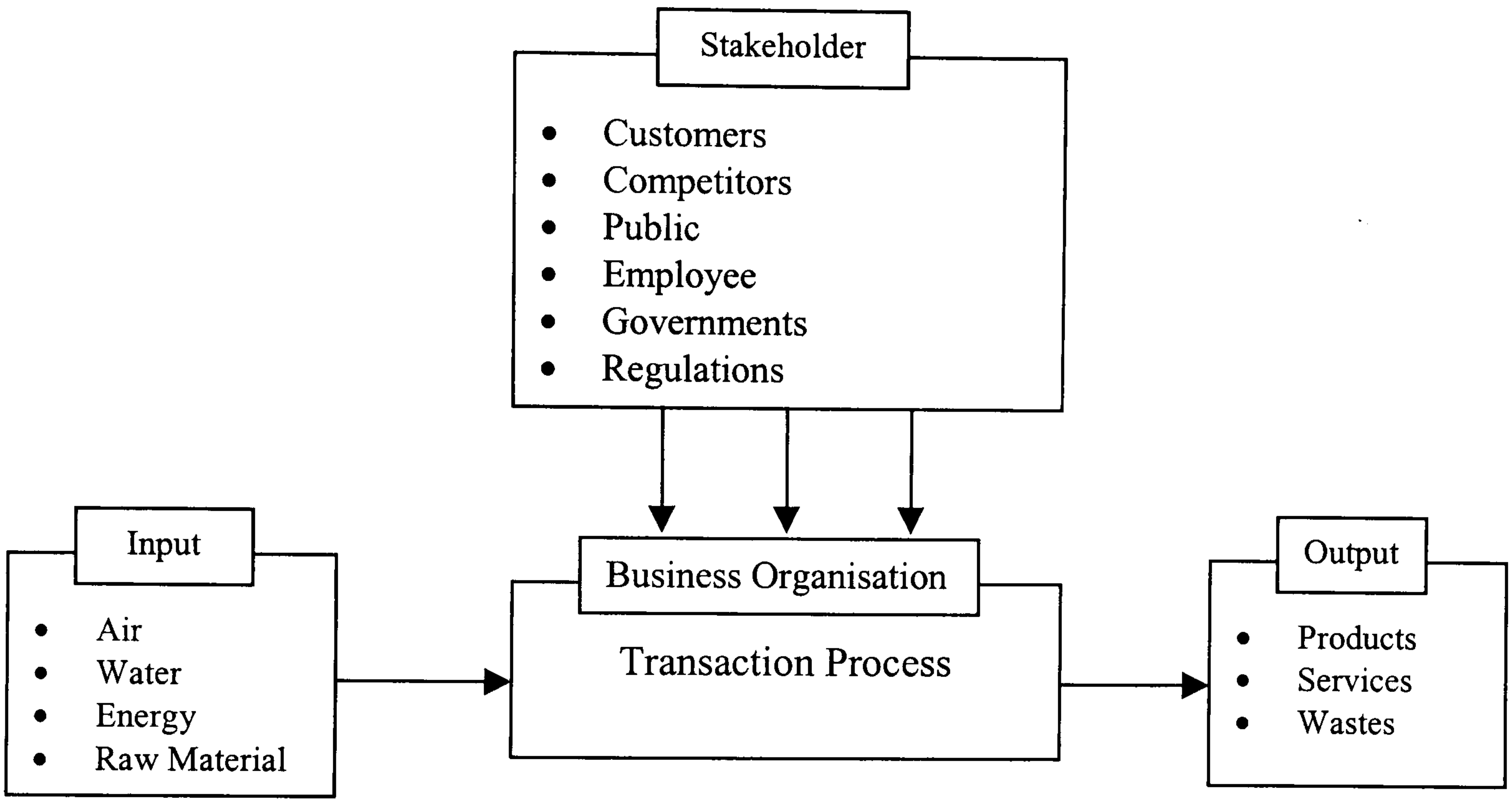
This chapter positions business organisations within the context of the literature on organisational study and strategic management. It is posited that corporate greening is closely related to the context in which it functions, and hence that much of the variation in corporate behaviour may be explained by variation in contextual influences. The model draws on two major areas of study: the impact of the external environment on organisations, and corporate response through strategic management.

First of all, in order to capture the meaning of "green" in business organisations, it is important to distinguish to green environment from the more general market environment in organisational study and strategic management. In order to do this the nature of the ecological problem needs to be outlined. This exercise is important because it provides the context in which business strategy operates. Second, it is important to outline how companies can go green so that we know specifically what "greening" means. Firms can make changes to their policies, processes or products with each representing a different level of commitment.

3.2. Business organisation as an open system

The research adopts an open systems conception of business organisations (Rice, 1963; Thompson, 1967). In this view, the organisation is seen as importing various inputs from its external environment, utilising these inputs in various kinds of processes, and then exporting the outputs into the external environment (von Bertalanffy, 1968). This view is illustrated in Figure 3.1.

Figure 3.1. The Systems View of Business Organisation



The systems approach also places the organisation within the wider social and ecological environment. General Systems Theory (GST) advocated by von Bertalanffy (1968) likens commercial and industrial organisations to biological organisms and observes that any part of an organism's activity affects other parts of the organism (Clayton and Radcliffe, 1996). In the work of early general systems theorists including Miller and Rice (1967) organisations were studied as social systems set within the environment of society as a whole. Such studies demonstrated that factors like the introduction of technological innovation would disrupt established patterns of social interaction in the workplace as old methods of working are replaced by the new. GST enabled the organisation to adapt internally in response to pressure for change from external sources, including pressures for environmental sustainability. The nature of the firm's external transactions is the critical dimension, and its viability or survival over time hinges upon its ability to adapt to the dynamic forces operating in its external environment. In this sense, the open systems view recognises that the external environment is a major stimulant for change. According to Katz and Kahn (1966, p.449), "In the absence of external changes, organisations are likely to be reformed from within in limited ways. More drastic or revolutionary changes are initiated or made possible by external forces."

Various academics in organisational study have focused on the properties of the external environment which seem to be important for organisational structure and functioning. One of the first who studied this were Burns and Stalker (1961). Burns and Stalker (1961) found that successful firms in a stable environment tended to have mechanistic or highly bureaucratised structures and processes, while successful firms in changing and uncertain environments tended to have organic or flexible structures and processes. Their findings confirmed the view that environmental factors were an important influence on organisational responses and changes.

The following two sections, 3.3. and 3.4 literature on organisational study and strategic management investigate the meaning of environment in more detail. The main focus of the two sections is environmental uncertainty. Since environmental uncertainty has been closely related and developed in both organisational literature and strategic management, it is worthwhile to discuss environmental uncertainty in both literatures.

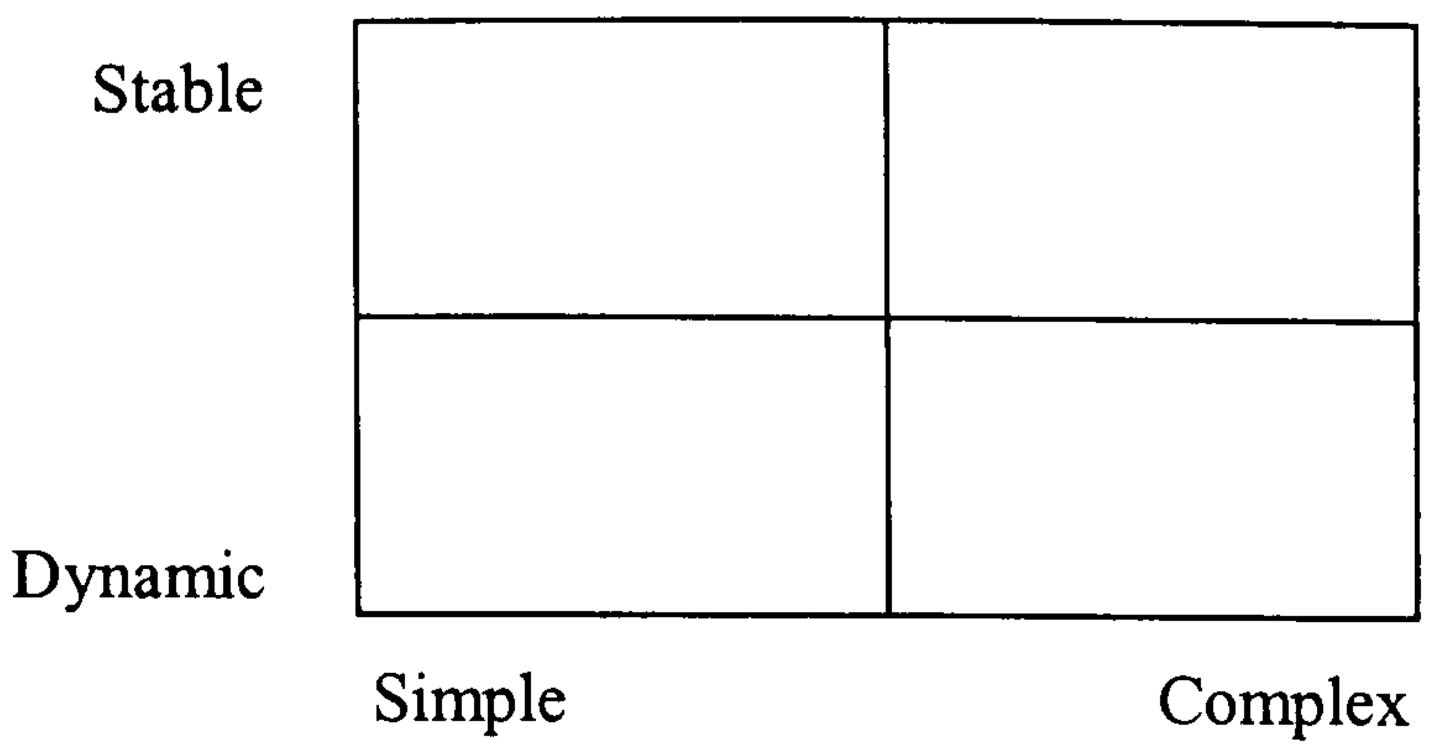
3.3. The Environment in Organisational Literature

3.3.1 Organisation's Environment

Analysing the complexity and uncertainty of the environment as a whole is a practically impossible task (Bourgeois, 1980). Instead, decomposing the environment into segments is suggested (Bourgeois, 1980; Hambrick, 1982). Two broad environmental segments have been identified: general environment and task environment. These refer to wider and more distinct environmental concern, and the more immediate issues concerned with an organisation' central operations. Thus, the general environment includes political/legal, economic, socio/cultural, technological and green/ecological environments (Bourgeois, 1980; Daft *et al.*, 1988; Ebrahimi, 1997, 2000; Hall, 1997, Sawyerr, 1993). The task environment includes competitors, customers, and suppliers (Daft *et al.*, 1988; Ebrahimi, 1997, 2000; Sawyerr, 1993).

The bulk of strategy researchers agree that the environment is central to a firm's existence, and acknowledge that there is a close relationship between strategic and organisation choices made and the characteristics of an organisation's environment (Aldrich, 1979; Lawrence and Lorsch, 1967). Some strategies are considered to be better suited to certain types of environments than others (Hambrick, 1983; Segev, 1987). One of the earliest descriptions of the environment is Duncan's (1972) study. Duncan (1972) suggested that environments can be viewed in terms of two dimensions: simple-complex versus stable-dynamic. The simple-complex dimension refers to the number of disparate elements that are pertinent to the organisation, while the stable-dynamic dimension refers whether or not the elements in the environment are static over time or changing. Duncan (1972) found that perceived uncertainty is greatest when the decision unit faces a complex, dynamic environment.

Figure 3.2. Duncan's (1972) view of the Environment



One of major contributions of Duncan's (1972) work is that the perceived environment influenced managers' choices in decision-making situations. Daft and Weick (1984) have developed Duncan's (1972) work, proposing that an organisation's level of response would depend upon whether the environment was considered analysable or unanalysable. Daft and Lengel (1986) added the dimensions of unequivocality, certainty, analysability, variety and intrusiveness to Daft and Weick's (1984) work.

Other researchers have focused on the problems and patterns of inter-organisational interaction. The web of relationships between an organisation and its competitors, suppliers, customers, unions, pressure groups and regulators is vast and complicated. Evan (1966) has examined the nature of an organisation's external environment in terms of organisational sets, while Warren (1967) and Levine and White (1961) utilised the concept of exchange or transactional interdependencies in examining inter-organisational relations. For example, Aiken and Hage (1971) found a positive relationship between innovative behaviour in an organisation and its interdependence with the environment. Interactions between organisations may involve flows information, of goods, or of influence.

3.3.2. Business Organisation and Environmental Uncertainty

The concept of uncertainty has emerged as a primary variable linking a great number of organisational characteristics to conditions in the environment. March and Simon (1958) suggested that uncertainty absorption is one of the most fundamental functions of an organisation. Weick (1969) and Galbraith (1973) also argued that organisation structure largely evolves from attempts to remove equivocality from external information and to process this information during the performance of internal tasks. Similarly, Thompson (1967) claimed that "uncertainty appears as the fundamental problem for complex organizations and coping with uncertainty, as the essence of the administrative process" (p.159).

In organisational study over last thirty years, the analysis of environmental uncertainty has been receiving increased attention. For example, Thompson (1967) provides four dimensions of external environment: homogeneous-stable, homogeneous-shifting, heterogeneous-stable and heterogeneous-shifting. Similarly, Lawrence and Lorsch (1967) suggest four different types of external environment: low diversity and non-dynamic, low diversity and highly dynamic, high diversity and non-dynamic, and high diversity and dynamic. As mentioned earlier, Duncan (1972) develops different types of environment in terms of simplicity and complexity dimension. More recently, Miles and Snow (1978) empirically studied executives' who perceived environmental uncertainty in terms of lack of predictability in strategic decision makings. They found that strategic decisions were dependent on executives' perceived environmental uncertainty. If they perceived their environments as unpredictable, their decisions may be defensive. However, when they perceived their environments as highly predictable, then decisions are more likely to be proactive.

As shown above, environmental uncertainty means different things to different researchers. However, Miles and Snow's (1978) notion of environmental uncertainty based upon predictability has been highlighted over two decades in organisational literature (Buchko, 1994). Based upon Miles and Snow's (1978) notion of environmental uncertainty, Milliken (1987) argues that "environmental uncertainty is an inability to predict accurately what the outcomes of a decision might be." (Milliken, 1987, p.134). This view of environmental uncertainty leads to green environmental uncertainty. The studies of broader organisational uncertainty do not specifically consider certain aspect of green constraints and problems, but we can develop the area of organisational environment into a careful concept of green environmental uncertainty. Since Miles and Snow's (1978) research instrument is employed, their typology with environmental uncertainty will be discussed later on.

3.4. The Environment in Strategic Management

Most strategic analysis suggests that the organisational environment is multidimensional comprising economic, social, political, cultural and technological forces (Johnson and Scholes, 1997). However, the economic environment and market environment tends to be given the most importance. Porter's (1980, 1985) concept of competitive market environment is the reigning view of environment in the strategy field. In Porter's (1980, 1985) view, there are five competitive forces which comprise, barriers to entry, rivalry among competitors, power of buyers and suppliers, threat of substitutes, and industry regulations. These forces determine the profitability and competitive structure of industries. In his view, the relationship with customers and suppliers, and the threat of new competitors or substitute products, determine the level of profitability in the industry. Porter (1989) emphasises the importance of positioning organisations within the selected industries. The choice of strategic position should be based on a thorough analysis of the organisation's capacity to manage the five competitive forces. Yet, the ecological environment is often marginalised (Hart, 1996).

Variables of interest relevant to the organisational environment include customers, suppliers, competitors, regulators, industry growth rate, product demand and resource allocation (Miles and Snow, 1978). The assumption of this perspective is that firms will seek to maximise profits, and strategic management theory suggests various strategies for obtaining greater profits. For example, in declining industries, where profits are falling, firms are advised to change their behaviour so that they could get an increasing share of a smaller market, or to exit the industry altogether (Hambrick, 1983a). Also, in highly volatile environments or mature product environments, economic and market variables such as sales volatility, industry growth rate, product demand, industry concentration, and advertising expenditures are used (Eisenhardt, 1989). Analysis, therefore, assumes that firms should seek always to improve profits rather than merely ensure organisational survival.

3.4.1. Strategic Decision Making and Environmental Uncertainty

Many business and management academics have focused on external factors and influences on organisational change and strategy. Terreberry (1968) hypothesised that organisational change is largely externally induced by forces in the environment. She argued that organisational adaptability is the ability to learn and perform according to changing environmental contingencies. Child (1972) postulated three conditions of the external environment which appear to be critical for organisational processes: 1) environmental variability, or the degree of change which characterises environmental activities relevant to an organisation's operations; 2) environmental complexity, or the heterogeneity and range of environmental activities which are relevant to an organisation's operations; and 3) environmental illiberality, or the degree of threat that faces organisational decision-makers in their achievement of their goals from external competition, hostility, and even indifference.

Lawrence and Lorsch (1967) studied the influence of the external environment on the differentiation and integration of organisational functional units. They found that different configurations of organisational structure are required to cope with different environmental conditions. That is, organisational success in uncertain environments required high differentiation between functional sub-units and the use of elaborate integrative mechanisms to co-ordinate sub-unit activities. Duncan (1972) has studied the characteristics of environments with respect to perceived environmental uncertainty and found that perceived uncertainty is greatest when the decision-maker faces a complex, dynamic environment.

Both Lawrence and Lorsch (1967) and Duncan (1972) also focused on the level of change as a key environmental dimension, arguing that the more variable and unpredictable the task environment, the more flexible organisational structure and process must be. Other researchers (Tosi *et al.*, 1973; Downey *et al.*, 1975) found that managers or decision makers who perceived uncertainty influence organisational responses more directly than does objectively determined uncertainty.

Child (1972) and Miles *et al.* (1974) have emphasised the importance of decision makers who play a major role at the interface between the organisation and its environment. They reject any deterministic environmental interpretation that suggests that organisational characteristics are fully preordained by technological considerations or environmental conditions. Instead, they view an organisation's activity as the result of "strategic choice". Similarly, Weick (1977) argues that organisational environments are acts of managerial invention rather than discovery, and thus researchers' task is to investigate how and why managers focus their attention on a particular portion of the environment, and how they interpret this information for decision-making purposes.

Other scholars have also emphasised the importance of decision makers who serve as the link between the organisation and its environment. Advocates of this approach view an organisation's domain of activity as the result of managerial choice.

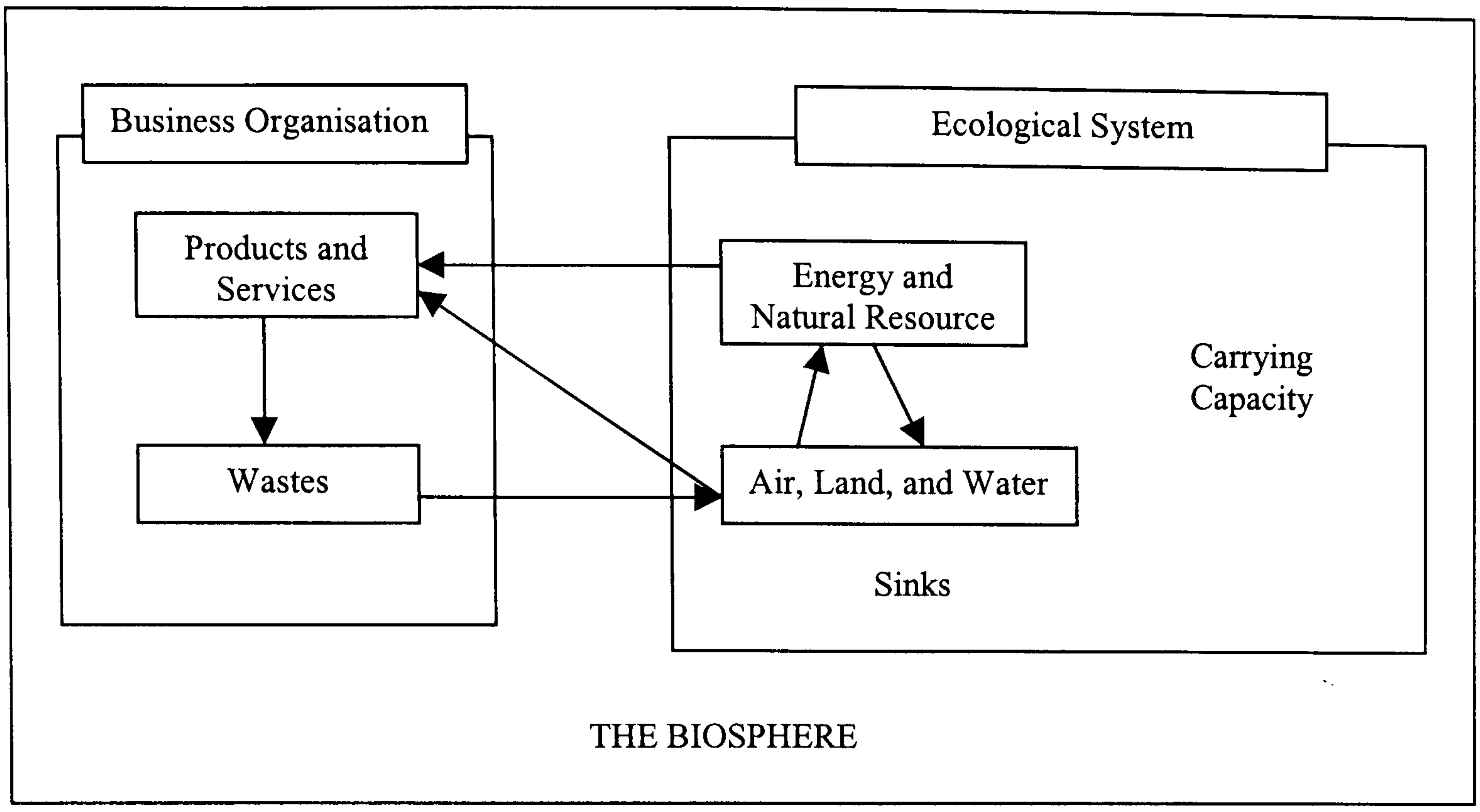
Miles and Snow (1978) view managerial or strategic choice as the primary link between the organisation and its environment. Furthermore, they focus on management's ability to create, learn about, and manage the organisation's environment. They encompasses the multiple ways that organisations respond to environmental conditions. More recently, this view can be found in corporate environmental management (Schaefer and Harvey, 1998; Banerjee, 2001). For example, Schaefer and Harvey (1998) argue that evolutionary approach rather than revolutionary one gives the importance of external pressures both for and against stronger environmental management. Yet, the deterministic aspects of the evolutionary approach cannot fully explain an eventual convergence of all existing companies to one broad strategy, and the market's ability to choose environmentally responsible over environmentally irresponsible businesses.

3.4.2. The Green Environment and Business Organisation

As where suggested, the term green environment is an ecologically grounded concept that can be seen as a part of organisational environment. Green environment here is the eco-biosphere view of organisational environment. Business organisations are seen to be operating within a physical biological boundary, and Figure 3.3 illustrates the relationship between business organisations and ecological systems. The business organisation interacts with ecological systems, from obtaining raw material for products to producing by-product and wastes, which has limited carrying capacity.

Green issues can be classified not only by the type of resource but also by the geographical scope of the impact. Green issues can range from the global, such as the build-up of greenhouse gases and the depletion of the ozone layer, to the local in which only the local community suffers as in the case of noise or smell issues. The Dutch government's report titled, *Concern for Tomorrow* (Business International, 1990), suggests that the nature of impacts have become more global in intensity. Figure 3.3 shows the relationship between the organisational and ecological dimensions under the eco-biosphere. Since the ecological system has limited carrying capacity, natural resources as inputs of products and services need to be protected by corporate organisations.

Figure 3.3. Relationship of Ecological System and Business Organisation



Surveys show that society is concerned about the natural environment. For example, the 1993 survey of Public Attitudes to the Environment published by the UK Department of the Environment (1993) shows that 85% of people indicated concern for the environment. Global warming, ozone depletion, and acid rain have now become household terms. Awareness of ecological issues has been fuelled particularly by the increased media coverage given to environmental disasters such as the gas leak in Bhopal, the nuclear melt-down of Chernobyl and the oil spill of the Exxon Valdez. These concerns for the environment have also started to influence the business community. Industries which are prone to environmental problems, such as the chemical industry, face the challenge of how to manage their environmental risk. Firms in this industry need to address issues pertaining to hazardous waste management and unwanted discharges of effluents. A disaster could be fatal. Corporate environmental management and strategic management can build awareness and disaster control capabilities within the firm (Shrivastava, 1995b).

These capabilities permit the firm to practice proactive risk management, risk communication, and liability management (Buzzelli, 1991).

As shown earlier, the green environment has been mostly ignored in organisational literature or strategic management even though business organisations consume natural resources as inputs for production and operation (Gladwin, 1993). Yet consideration of this issue is vital. As Costanza (1992) points out, the planet Earth has a limited carrying capacity. Current development and operation of business organisation keep causing ecological harm because organisations have not considered the green environment as part of their wider environment.

The dimensions of economic, social and environmental structures occur within the natural environment. These dimensions consist of nations' economic, social, cultural and political histories; also, international agreements and laws which govern economic relations between nations. Within this relationship, many businesses face specific economic, social, political, regulatory and technological circumstances which create opportunities and constraints for them. Thus, the green environment is a part of organisational environment. Businesses have begun recognising green issues. For example, a survey of UK companies conducted by the Institute of Directors revealed that 58% of firms devoted boardroom time to ecological concerns (Reuters News Service, 1995). Organisations that view the green environment as a part of organisational environments would establish ecological missions, develop ecological strategies, and even enhance environmental performance (Shrivastava, 1994).

But admitting the green environment as a part of organisational environment, decision-makers are thereby accepting that they face environmental uncertainty regarding green issues (i.e. green environmental uncertainty). Adapting Milliken's (1987) definition of environmental uncertainty, green environmental uncertainty can be defined as: **a decision maker's perceived inability to predict accurately what the green attributes related outcomes of a decision might be.**

3.5. The Miles and Snow's (1978) Typology in Business Strategy

Business strategy has been a dominant aspect of business research in the last two decades, and several typologies of business strategies have been developed, such as Miles and Snow's (1978) and Porter's (1980). Typologies are classification schemes which provide "a means for ordering and comparing organizations and clustering them into categorical types" (Rich, 1992, p.758). One of the reasons why researchers commonly use typologies is "to provide a parsimonious framework for describing complex organisational forms and for explaining outcomes" (Doty and Glick, 1994, p.230).

Miles and Snow (1978) provide a useful framework for examining strategic adaptation with consideration of business organisations' environmental conditions. Miles and Snow assume that organisations adapt to the environment, however this is determined by the strategic choices of top management. Their view, which is rooted in the strategic choice concept of Child (1972), is that: "top managers largely enact or create the organization's relevant environment. That is, the organization responds largely to what its management perceives" (Miles and Snow, 1978, p.20). Strategic choice academics (e.g. Child, 1972; Weick, 1977) argue that managers do not respond to pre-ordained environmental conditions but rather create their own environments through the choices they make about products, markets and technologies. In strategic management, Porter's (1980) five competitive forces similarly emphasise how to respond to external environmental conditions while Miles and Snow (1978) pay more attention to executives or board members who perceive their environments selectively and make strategic decisions accordingly.

Miles and Snow (1978) propose that organisations develop distinctive and relatively enduring patterns of strategic behaviour to co-align the organisation with the environment. According to Miles and Snow (1978), an organisation can be classified as a defender, prospector, analyser, or reactor depending on the pattern of interaction between the organisation and its environment. Prospectors perceive a dynamic, uncertain environment and maintain flexibility to combat environmental change. The prospector seeks to identify and exploit new product and market opportunities. Prospectors' characteristics include a diverse product line; multiple technologies; a product or geographically divisionalised structure and skills in product research and development, market research and development engineering. In contrast, defenders perceive the environment to be stable and certain, and thus seek stability and control in their operations to achieve maximum efficiency. The defender is characterised by a narrow and relatively stable product-market domain, single capital intensive technology; a functional structure; and skills in production efficiency, process engineering and cost control. Analysers stress both stability and flexibility and attempt to capitalise on the best of both of the preceding strategic types. According to Miles and Snow, the analyser operates in two differing types of product-market domain – one relatively stable, the other changing. Given different market demands analysers enact a diversity of behaviour. Thus they are characterised by a limited product line; search for a small number of related product and market opportunities; cost-efficient technology for stable products and project technologies for new products; skills in production efficiency, process engineering and marketing. The reactor is the type of strategy where managers perceive change and uncertainty but are unable to respond effectively. Reactors lack a consistent strategy and act when the environment forces them to do so, and perform poorly. Table 3.1 summarises these four strategic patterns.

Table 3.1. Miles and Snow's (1978) Typology of Business Strategy

Strategic Variable	Archetypes	Features
Strategic Pattern	Prospector	Turbulent domain, always seeking new product and market opportunities, uncertain environment, flexible structure.
Strategic Pattern	Defender	Stable domain, limited product range, competes through low cost or high quality, efficiency paramount, centralised structure.
Strategic Pattern	Analyser	Hybrid, core of traditional products, enters new markets after viability established, matrix structure.
Strategy Lacking	Reactor	Lacks coherent strategy, structure inappropriate to purpose, misses opportunities, unsuccessful.

Source: Adapted from Nilsson and Rapp (2000), p. 200.

Since analyser pursues hybrid strategies that exhibit some characteristics of the prospector and defender types, and reactor has simply no strategy, these two types, not surprisingly, have been neglected in academic researches (Thomas and Ramaswamy, 1996). Miles and Snow (1978) elaborate their typology of prospectors and defenders analysis based on three strategic dimensions – entrepreneurial, engineering and administrative dimensions.

Prospectors are the most proactive business organisations in all three strategic dimensions while defenders are the least proactive. The entrepreneurial dimension is concerned with choices of products, markets and ways of competing. Prospectors examine all aspects of their contexts to seek new products and market opportunities, so prospectors should consider green issues (Gladwin *et al.*, 1995; Hart, 1995). They should tend to develop products and services with minimum environmental impact. The characteristics of prospectors on this dimension are close to those considered as environmentally advanced. The engineering dimension concerns choices of technologies for developing competitiveness. By improving efficiency and reducing cost, prospectors will achieve more environmentally advanced levels of production and technologies. Prospectors are willing to invest to enhance their technological leadership and competitiveness (Porter, 1995; Porter and van der Linde, 1997). Dvir *et al.* (1993) argue that once firms identify new opportunities in the entrepreneurial stage, the engineering stage will provide the necessary solutions. Finally, the administrative dimension concerns choices of organisational process for reducing uncertainty and future innovation in new market opportunities, emerging environmental trends. In this dimension, the marketing and R&D departments play a crucial role through project-oriented plans.

Miles and Snow's (1978) typology gives implications for proactive-reactive scale corporate organisational responses with regard to green issues. Proactive organisations (prospector) would seek green market opportunities and develop green products even though their environment is uncertain and turbulent. In contrast, reactive organisations (reactor) would ignore green opportunities or new markets because of lack of strategy and commitment. As Miles and Snow point out, managerial interpretations, in particular, at board level give a significant influence to form proactive or reactive organisations. In addition, top management commitment from the interpretations makes differing strategies from proactive and reactive.

3.6. Strategic Dichotomy: Opportunity or Threat

3.6.1. Interpretation of the Environment

One approach in assessing the environment is to consider the competitive environment, as advocated by the industrial organisation economics perspective (Porter, 1980, 1985). Competition is a function of structural forces in an industry. As mentioned earlier on page 45, there are five forces that determine the profitability and competitiveness of industries. By analysing them, managers can identify opportunities and threats facing their firm.

The other approach is that managers' perceptions and attitudes have an impact on performance outcomes. Aldrich and Pfeffer (1976) argued that the way the environment is assessed is likely to lead to different performance outcomes. Anderson and Paine (1975) suggested that managers have a certain degree of freedom in making strategic choices, these freedoms result from perceptions of both environmental and internal properties. Weick (1969) and Duncan (1972) supported this view. Weick (1969) suggested that managers selectively perceived environmental influences responded to their organisational environments. Similarly, Duncan (1972) believed that the perceived environment influenced managers' choice in decision-making situations. Thus, decision-makers who selectively perceived environment can view their environment as an opportunity or a threat. Perceiving organisational environment as an opportunity or a threat can influence to form business strategies. Since corporate responses are dependent upon the way environmental conditions have been labelled (Waddock and Isabella, 1989), categorising environmental signals from managers' perceptions as a label of opportunity or threat can be critical to understand corporate "greening" responses in this research.

3.6.2. Categorisation of the Environment as Opportunity or Threat

Understanding and interpreting the environment leads to different ways of information collection and decision making. For example, if senior managers view a situation as a threat, then information will be gathered in a particular way, and subsequent decisions will be constrained by initial assumptions (Sallivan and Nonaka, 1988). In contrast, when a situation is recognised as an opportunity, different output exists. Smircich and Stubbart (1985) argued that environments are "enacted" by strategists. According to Smircich and Stubbart (1985), "There are no threats or opportunities out there in an environment, just material and symbolic records of actions. But a strategist - determined to find meaning - makes relationships by bringing connections and patterns to the action" (p.726).

A decision maker can perceive parts of his or her environment as posing a threat or offering an opportunity. There is not necessarily any strict distinction between threat or opportunity because threats can be perceived as opportunities and *vice versa*. Threat-opportunity states assume varying degrees of uncertainty. If decision makers perceive a situation as analytical, stable and predictable, they are more likely to take a proactive strategy rather than a reactive one (Thompson, 1967; Miles and Snow, 1978). Thus, perceiving the environment as threat or opportunity is dependent upon the degree of perceived uncertainty. In addition, the basis of the threat or opportunity may lie in differences in the interpretation of information and the use of different kinds of information (Jurkovich, 1974). For example, in Miles and Snow's (1978) terms, for a prospector, issues arising from competitors' new product developments are regarded as being on top of the strategic agenda. In contrast, for a defender, issues surrounding competitors' new cost-cutting actions may become the top issue. Once an issue is placed at the top of the strategic agenda, it is labelled and categorised. The label would be "threat" or "opportunity". According to Dutton and Jackson (1987), opportunities refer to "a positive situation in which gain is likely" while threats refer to "a negative situation in which loss is likely" (p.80). The dichotomy of opportunity and threat offers a tool for green scanning activities.

3.6.3. Environmental (Green) Commitment

If we attempt to tie in these organisational issues more directly with green issues, it would be useful to understand how decision makers, particularly top managers, are committed on green issues.

Ghobadian *et al.* (1998) categorise environmental commitment as:

- Restrained commitment
- Speculative commitment
- Conditional commitment

Restrained commitment refers to companies that may want to make an environmental statement, but do not perceive any real need to follow up this statement with action. Thus, the category of restrained commitment can result in "greenwashing", which according to Hoffman (1997), reflects "the symbolic activities taken by some companies to demonstrate their environmental commitment, while their underlying practices and values remain unchanged" (p.157). Ghobadian *et al.*'s second type, speculative commitment, reflects companies that become leaders in the environmental field because they identify business opportunities such as increased market share, increased profitability, or reduced cost structure leading to competitive advantage. Thus, speculative commitment can be categorised as "opportunity seeker". Conditional commitment reflects companies that take different actions in different circumstances or countries. That is, companies' environmental commitment depends upon the prevailing business conditions, in particular operational bases. They may seek more proactive stances where their interests are best served by, for example, investing relatively heavily in environmental technology and pollution reduction systems. In contrast, they will take more reactive actions where their interests are best served by a reactive action. This commitment can be categorised as "it all depends".

3.6.4. Environmental Scanning

Strategic management focuses on aligning or matching the organisation with its external environment (Andrews, 1970; Ansoff, 1965). This match is important, as it allows the firm to capitalise on opportunities in the environment, while averting threats. In strategic management, environmental scanning is the process of seeking and collecting information about events, trends, and changes external to the business to guide the company's future actions (Aguilar, 1967; Fahey and King, 1977). Information gathered through environmental scanning is useful in formulating company objectives and selecting competitive strategies (Hax and Majluf, 1984; Hofer and Schendel, 1978; Porter, 1980).

According to Lawrence (1981), a firm's competitive position, financial success, and even survival depends on its ability to scan, understand, and adapt to environmental conditions. The external environment is a great source of strategic decision making (Duncan, 1972; Lawrence and Lorsch, 1967). As Jennings and Lumpkin (1992) suggest, environmental scanning is important in strategic management because it serves as "the first link in the chain of perceptions and actions that permit an organisation to adapt to its environment" (p.791). Environments post important constraints and contingencies for organisation, and their competitiveness depends on their ability to monitor and adapt their strategies based on information acquired through environmental scanning activities (Boyd and Fulk, 1996). Using the Miles and Snow (1978) typology, Rogers *et al.* (1999) examined the relationship among strategy, planning processes including scanning, and performance. They found that improved performance depends on matching strategic type with the appropriate planning processes including scanning. For example, defenders who appear to focus their information processing on critical internal efficiency information have improved performance. Since information about environmental opportunities and threats may facilitate strategic adjustments, environmental scanning activities result from decision-makers' perceptions, i.e. opportunity or threat.

However, as some (Cyert and March, 1963; Simon, 1961; Williamson, 1975) note, the ability of organisations to predict the effects of the environment and their capability of analysing organisational decision making is limited by the bounded rationality of decision makers. For example, external sources of information are less useful when the organisational decision-makers perceive the environment as complex and uncertain (Boyd and Fulk, 1996; Daft and Weick, 1984; Milliken, 1987). In addition, not all environmental information may be categorised in the same manner by all organisations. The same issue could be categorised by one organisation as an opportunity and by another as a threat based on the organisation's conditions and decision-makers. Hambrick (1981) as cited in Dutton and Jackson (1987) posited that "an organisation's strategy imposes a type of strategic requirement, defining some issues as critical and others as inconsequential" (p.79). That is, decision-makers' selective perceptions cause the environmental scanning process to focus on what is needed to perform the organisation's strategy and to ignore information that seems irrelevant to that strategy (Thomas and McDaniel, 1990). Using a prospector in Miles and Snow's (1978) typology, Dutton and Jackson (1978) suggest that "issues arising from competitors' new product developments easily penetrate this strategic filter" (p.79).

According to Ansoff (1975), organisations with a proactive strategy will scan their external environment looking for opportunities, while organisations with a reactive strategy will scan for problems. Similarly, Hrebiniak and Joyce (1985) suggest that differences in strategies make it imperative for organisations to employ different environmental activities. In a study of 151 hospitals, Thomas and McDaniel (1990) found that both strategy and information processing influence how chief executives label strategic situations.

3.7. Corporate Organisational Response

After an environmental assessment, interpretation and categorisation, there is some kind of strategic decision or response. The interpretation of the environment is concerned with specialised information reception and equivocality reduction (Daft and Lengel, 1986).

Mintzberg *et al.* (1976) define a decision as a specific commitment to action, which usually involves a commitment of resources, and a decision process as a set of actions and dynamic factors that begins with the identification of a stimulus for action and ends with a specific commitment to action. According to Daft and Weick (1984), when an organisation assumes that the external environment is analysable, it follows a certain course of action. In contrast, when an organisation assumes that the external environment is unanalysable, an entirely different routine is likely to be followed.

The core of the organisational response is to be able to first understand the competitive environment, and then to develop predictions about the environment in order to respond appropriately (Waddock and Isabella, 1989). Responses depend upon the way environmental conditions have been labelled, i.e. on the way the strategic problem has been defined. The categorising process of environmental signals is critical. Labels in the categorisation process are based on threat and opportunity. Threat and opportunity interpretations derive from perceptions of issues as being either negative or positive, potential losses or gains, and as being uncontrollable or controllable (Dutton and Jackson, 1987).

Based on the literature on strategic response and environmental uncertainty, the following two-dimensional matrix, setting out dimensions of organisational response can be developed (Figure 3.4). The first dimension is a measure of proactive versus reactive behaviours, and the second measure is whether the level of top decision makers' (i.e. top managers or CEOs) perceived uncertainty as high or low when attempting to influence its environment. The four organisational response combinations are proactive behaviour that is either a high or low level of environmental commitment by top executives, and reactive behaviour that is either a high or low level of uncertainty perceived by top executives.

Figure 3.4. Dimensions of Organisational Response

Organisation's Response		
Proactive	*Proactive and Low Commitment*	*Proactive and High Commitment*
Reactive	*Reactive and Low Commitment*	*Reactive and High Commitment*
	Low	High

Executives' Perceived Uncertainty

Applying green environmental uncertainty and green environmental commitment as mentioned earlier, a similar two-dimensional matrix of green organisational response can be developed (Figure 3.5). The first dimension is a measure of proactive versus reactive green behaviour, and the second dimension is whether the level of top executives perceived green uncertainty is high or low when attempting to influence its environment. The four organisational response combinations are proactive green behaviour that is either a high or low level of perceived environmental commitment by top executives, and reactive green behaviour that is either a high or low level of uncertainty perceived by top executives.

Figure 3.5. Dimensions of Green Organisational Response

Organisation's Response		
Proactive	*Proactive and Low Green Commitment*	*Proactive and High Green Commitment*
Reactive	*Reactive and Low Green Commitment*	*Reactive and High Green Commitment*
	Low	High

Executives' Perceived Green Uncertainty

Under external forces including market pressure, government legislation, and social and environmental pressures, top executives face increasing environmental uncertainty for strategic decision making (Hawken *et al.*, 1999). With regard to green environmental uncertainty, top executives encounter relevant green external factors such as green market, environmental government legislation, green competition, and green stakeholders. Using environmental scanning to identify opportunity or threat, top executives may show their different level of environmental commitments (restrained, speculative and conditional commitment). Thus, levels of commitments can be related to perceived green uncertainty. If executives perceive high green uncertainty, then they may express different levels of commitments in different conditions. Identifying green opportunity or threat and different levels of environmental commitment may bring different corporate greening responses. Figure 3.6 illustrates a simplified set of corporate greening responses.

Figure 3.6. Interaction of external factors, decision making and corporate greening strategies.

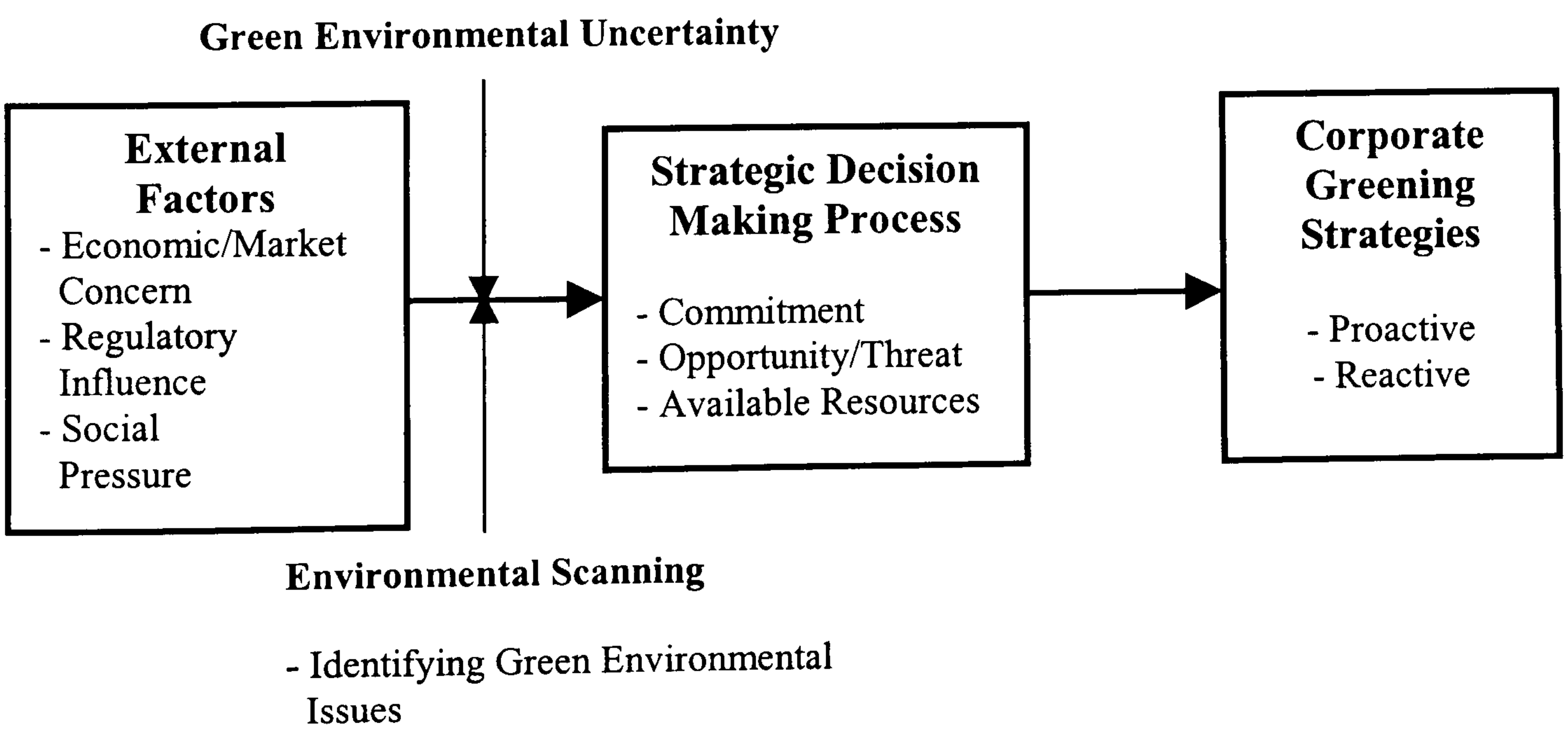


Figure 3.6 provides a graphical framework to understand green issues in strategic decision making at board level. In addition, it helps to identify factors which influence strategic decisions which are made by executives. The assumption of the model in Figure 3.6 for green environmental uncertainty is that executives play a key role in corporate greening strategies.

3.8. Corporate Responses to Green Issues: Corporate Greening Response Models

Academic journals such as *Business Strategy and the Environment* (BSE), *Greener Management International* (GMI) reflect a growing "green" issues in business and management research. Considerable attention has been paid to corporate environmental management. Corporate environmental management has focused in particular on the development of typologies of environmental management approaches (Arthur D. Little, 1989; Hunt and Auster, 1990; Roome, 1992; Post and Altman, 1992, 1994; Sadgrove, 1992; Scallon and Sten; 1996). The study of Arthur D. Little (1989) proposed a three-stage framework (problem solving, compliance, and assurance). Hunt and Auster (1990) provide an expanded set of stages, from a beginner to a proactivist (beginner, fire fighter, pragmatist, proactivist). Roome (1992) identifies four-stage corporate responses (non-compliance, compliance, compliance plus, and leading edge/excellence). Post and Altman (1992, 1994) offer three-stage models (adjustment, adaptation/anticipation, and innovation). Sadgrove (1992) propose four corporate environmental positions (laggard, punished, conformer, leader). In the Scallon and Sten (1996) typology there are four different corporate response types (compliance, alignment, expansion, and integration). Table 3.2 shows six different corporate greening models as mentioned above.

Table 3.2. Corporate Greening Response Models

ADL (1989)	Hunt and Auster (1990)	Roome (1992)	Post and Altman (1992, 1994)	Sadgrove (1992)	Scallon and Sten (1996)
Problem-solving	Beginner	Non-compliance	Adjustment	Laggard	Compliance
	Fire fighter	Compliance	Adaptation/	Punished	Alignment
Compliance	Pragmatist	Compliance plus	Anticipation	Conformer	Expansion
Assurance	Proactivist	Leading edge/excell-ence	Innovation	Leader	Integration

Most of these typologies agree that companies' strategic responsiveness to environmental issues describes a continuum, which ranges from reactive compliance and legislation at the lower end to proactive practices at the upper end. To illustrate this we can elaborate one of the best known models. Roome (1992) categorises four different levels of corporate response. The lowest level, non-compliance, reflects a firm that fails to address the requirements of environmental regulation and other external pressures. Firms in this level are identified as having little strategic vision and a limited understanding of the environmental issues within their business activity. The second level, compliance, reflects a firm that has a more aware attitude. However, firms in this level are still reactive, and pursuing a minimum level of environmental requirements to avoid legal actions or lost market share. The third level, compliance plus, reflects a firm which takes a more proactive stance. Firms at this level are becoming aware of the potential competitive advantage to be gained from environmental commitment and leadership. In addition, such firms often take actions beyond existing environmental legislation and requirements. The fourth level, leading edge/excellence, is that of the environmental champion. Roome

(1992) sees firms at this final level achieving commercial and environmental excellence through innovative solutions to environmental problems.

This research has provided a broad understanding of the content of corporate greening efforts. However, little attention was given to the process of corporate greening within business organisations. For example, developing typologies of environmental management identifies corporate responses and attitudes to green issues. But it does not give detailed explanations as to why and how business organisations respond in certain ways. Using Roome's (1992) typology, more recently Aragón-Correa (1998) surveyed 210 CEOs of Spanish firms in 10 different industries, and demonstrated that the typology of natural environmental postures by Roome (1992) is only partially useful. According to him, "Firms' natural environmental development cannot be fully described in terms of just one dimension, as Roome suggested" (p.563).

In a similar vein, with Norwegian cases, Hass (1996) points out that Roome's (1992) typology has limited explanations with regard to corporate environmental response. More recently, Anya and Harvey (1998) reached a similar conclusion. Anya and Harvey applied Roome's (1992) and Hunt and Auster's (1990) typology in the British context. According to them, the typology of environmental management is useful in demonstrating the grouping of similar business organisations. However, it does not clearly typify all business organisations in different categories and typologies.

3.9. Conclusion

This chapter has explored the meaning of environment in organisational study and strategic management. With regard to organisational environments, environmental uncertainty has received much attention in the last two decades. Some researchers argued that the perceived environment influenced managers' choice in decision-making situations (Duncan, 1972; Miles and Snow, 1978). However, the natural environment has been neglected as an element of the organisational environment. In order to reflect the natural environment within organisational environment, green environment and green environmental uncertainty are introduced and established as a part of organisational environment.

Adopting the green environment as a part of organisational environment, top decision-makers may perceive green environmental uncertainty as an opportunity or threat. Executives' environmental commitment and perception of green environmental uncertainty may influence directly or indirectly corporate responses, which can range from reactive to proactive. As Figure 3.5. and Figure 3.6 illustrated, there are different levels of commitments and these lead to different corporate greening responses. The conceptual framework implies two essential research tasks. The first is the importance of accurate and rich descriptions of factors in green environment and green environmental uncertainty. Research should increase the knowledge of the role of green factors in corporate strategy. The second is that of exploratory explanation. The direct and indirect influences of executives' commitment on the different strategy type need to be explored and explained. These tasks lead the following chapter 4 of corporate environmental management.

Chapter Four

Corporate Environmental Management (CEM): An Overview

4.1. Introduction

In this chapter, a brief introduction to the subject of corporate environmental management (CEM) will be provided. Current corporate environmental management adopts an industrial organisation (IO) or resource-based perspective. This view is more or less case by case evidenced. Adopting green environment as a part of organisational environment is reflected in corporate environmental management. This chapter will describe how the green environment is mirrored in corporate environmental management, and how each issue of corporate environmental management causes green environmental uncertainty for executives.

Current corporate environmental management brings in many aspects of conventional economics. In this aspect, it is assumed that firms always seek to maximise organisational value given the constraints imposed by resources and technology. Managers are seen to anticipate future threats and opportunities, engage in sound strategic analysis, set strategic objectives, and marshal, develop and dynamically allocate resources to implement strategy (Aguilar, 1992; Andres, 1980; Porter, 1985, 1991; Wemerfelt, 1984).

4.2. The Context of Corporate Environmental Management

Firms are confronted by a catalogue of business risks, both financial and non-financial, that can seriously threaten their immediate and long-term futures. The management of threats posed by business risks, through a process of identification, management and continuous monitoring, has become a top priority for senior executives and is widely regarded as an important boardroom activity (Martin, 1998). Table 4.1. shows the corporate context and historical pattern of environmental and safety issues. In the 1960s, Dasmann's (1966) book, *The Destruction of California* raised the danger of widespread use of chemicals and the issue of pollution. The chemical industry, in particular, responded to Dasmann's (1966) assertion of chemicals' danger to our society by promoting health and safety standards at working sites and facilities. In the 1980s, the Exxon Valdez oil spill in Alaska caused serious environmental damage to eco-systems in Alaska. Furious Americans punished Exxon for the Valdez oil spill by cutting up their account cards. A major industrial accident occurred at the Union Carbide pesticide plant in Bhopal, India. In the 1990s, Royal Dutch/Shell faced similar responsibilities in Nigeria. Local people blamed Shell's exploitation of oil and gas which paid little attention to protecting the local community and natural environment. As a result, Shell was confronted with national and international pressure from customers, government institutions, and environmental groups. The pattern observed in the above events is the transformation from a short-term health and safety focus to a long-term social and environmental focus.

Table 4.1. Corporate Context and Historical Pattern

Area of corporate strategic focus	Date parameters	Critical incident	To strategic core
Safety (short-term personal hazard avoidance)	1960s ~ 1970s	Product safety – cars, unsafe at any speed	Consumer rights and product reliability/safety increasingly reflected in legislation, as well as competitive pressures
Environment (long-term personal and societal hazard avoidance)	1980s ~ 1990s	1984 (Bhopal) – 1995 (North Sea and Nigeria)	Environmental care as an important secondary product; legislation and regulation of outputs; consumer expectations

Source: Adapted from Ledgerwood and Broadhurst (2000), p.243.

One particular business risk that has become a major concern for many firms is the threat posed by non-compliance with environmental permits, obligations and responsibilities. Over the last few decades, an increasing array of environmental laws and regulations at local, regional and international level have been enacted. These changes have made it increasingly important for organisations to introduce and continually monitor, review and revise their management systems, controls and procedures for ensuring that they remain in compliance with the law as well as on target to meet their voluntary commitments to society. In addition, many organisations have developed voluntary environmental policies, policy commitments and programmes, and have signed up to voluntary environmental charters and industry codes of practices.

Business organisations have also developed a variety of tools to monitor and manage the environmental impacts of their activities more successfully. These include environmental impact assessment, environmental audits, life-cycle assessment, and developments in environmental accounting and reporting. These tools, when coupled with the adoption of more systematic approaches to environmental management, are seen as having brought about not only improvements in environmental performance but also economic benefits, including reductions in the cost of pollution treatment, savings on raw materials and improved public image (Aloisi de Larderel, 1998). Table 4.2 shows examples of environmental programmes or tools which firms established for corporate environmental management. For example, EPA in the Netherlands developed life-cycle assessment (LCA) tool for the Dutch chemical industry. With the support of EPA, an academic community, Leiden University, developed LCA computer software *SimaPro* to analyse environmental impacts for the chemical industry.

Thus, better environmental management has come to be seen as not only a key source of competitive advantage but also a sign of a well managed company. From a strategic point of view, it is being increasingly recognised that a proactive attitude to corporate environmental management is more likely to pay dividends than a defensive or reactionary stance.

However, corporate environmental management is very much in its infancy as a business discipline. For some businesses, environmental issues are still perceived as a cost burden, whilst others see them as presenting an opportunity to enhance business (Scallen and Sten, 1997). In the US Pacific Northwest, Scallon and Sten (1996) surveyed 36 firms with relation to business environmental response. They found that when senior managers see environmental issues as business opportunities, they focus on the search for such opportunities. In contrast, they spend time on ensuring compliance and avoiding potential troubles when they see environmental issues as obstacles or threats. When such opportunities are not discovered, these managers aim to conduct business as usual as a reflection of core values. Perhaps one of the biggest challenges confronting business is in deciding on their environmental position and on the process of establishing that position.

Table 4.2. Recognised Programmes and Techniques for Corporate Environmental Management

Programmes	Sources
Total quality environmental management	3M
Life-cycle assessment	EPA: Dutch chemical industry
Product stewardship	IBM, BMW, Du Pont
Eco-efficiency	WBCSD
Environmental risk and liability management	Colonia
Environmental audit	Ciba-Geigy, Royal Dutch/Shell Groups, 3M
Environmental accounting and reporting	Deutsche Bank, Norsk Hydro
Environmental labelling	German Blue angel, Canadian Environmental Choice, Green Cross
Responsible care	Chemical industry
Environmental marketing	Esprit, Johnson Wax

Source: Adapted from Jennings and Zandbergen (1995), p.1021.

The literature on corporate environmental management, strategic management, organisational theory, environmental economics, environmental accounting and reporting and environmental marketing provides an overall context for research on corporate greening behaviour. This literature suggests that a series of pressures which are external to the firm are recognised and interpreted in light of a variety of factors which make up the firm's business context. These contextual factors, coupled with external pressures, result in the development of internal drivers for, and barriers to, environmental action. Internal drivers and barriers then shape corporate environmental change efforts. The implementation of environmental changes affects the organisation in two ways: First, some change occurs in environmental performance. Second, some organisational learning occurs. Performance outcomes and organisational learning feed back to the business context, and thereby impact the interpretation of future external pressures and the development of future internal drivers for environmental action. A more detailed discussion of these ideas follows.

4.2.1. External Pressures

External pressures which firms are facing range from government actions to the actions of individual stakeholders. They may also result from the following trends: general societal concerns about ecology (Stead and Stead, 1995), the movement towards sustainable development (Hart, 1997), green labelling schemes (Hass, 1996b), and general resource availability in the form of capital, infrastructure, and raw materials (Swinth and Vinton, 1992).

4.2.1.1. Regulations

Regulations are the most frequently cited external drivers for corporate environmental action, impacting firms at the local, state, national, and international levels (Angell, 1996; Gouldson, 1994; Hanna and Newman, 1995; Hart, 1997; King, 1993; Porter and van der Linde, 1995). Porter and van der Linde (1995) argue that the product and process changes prompted by environmental legislation can serve to increase a firm's international competitiveness. They assert that regulations are necessary to increase the likelihood that product and process innovations will be environmentally sound, and to level the competitive market during the transition to innovation-based environmental solutions. According to Porter (1991), "properly constructed regulatory standards, which aim at outcomes and not methods, will encourage companies to re-engineer their technology. The result in many cases is a process that not only pollutes less but lowers costs or improves quality. Processes will be modified to decrease use of scarce or toxic resources and to recycle wasted by-products" (Porter, 1991, p.168). Other government actions which can lead to corporate greening change within a firm include the financial support of environmental innovation projects (Moors *et al.*, 1995), regulatory enforcement activities such as audits (Cordano, 1993), and the implied reduction of regulatory pressures in exchange for proactive corporate greening change within industry (Hass, 1996). Thus, environmental regulations may cause green environmental uncertainty for executives and influence corporate greening response.

4.2.1.2. Environmental Taxes

Over the last ten years, the idea of using economic instruments for environmental protection has gained increasing support, particularly from OECD countries. A first OECD survey (OECD, 1989) identified 150 cases of economic instruments, out of which 80 were environmental charges/taxes in 14 OECD countries. In particular, Nordic countries (Denmark, Finland, Norway, Sweden) increased the number of environmental instruments by 50 percent between 1987 and 1993. One of most frequently cited topics is carbon tax. Carbon dioxide emissions from burning fossil fuels are thought likely to cause global warming. If producers and consumers had to pay energy-prices that reflected such a possibility, they would burn less fossil fuel. Carbon taxes have been introduced in Denmark, Finland, Norway, Sweden and The Netherlands. A tax on carbon-dioxide production encourages a shift to low carbon or no carbon fuels.

The present situation is characterised by the prevalence of mixed systems where economic instruments are used as an adjunct to direct regulation. In such systems, economic instruments complement regulation by providing additional incentives for pollution abatement and a source of revenue for financing environmental measures, such as the treatment of effluents, waste collection and processing. Since the actual combination of economic instruments and regulations varies between countries and the type of pollution, a number of researches are on going to collect empirical evidences from different countries and regions (e.g. MIT's global change programme in the U.S.).

However, there are uncertainties as to the real effectiveness of environmental taxes. No feed-back evaluation systems of the taxes have been installed, and little is known about the economic and social consequences beyond the economic models. There is also a lack of analytical capability to carry out such evaluations, which are usually implemented in conjunction with other policy instruments. In addition, unless environmental taxes are internationally co-ordinated, their implementation at the domestic level will be limited or subject to exemptions which erode their environmental effectiveness. This is particularly true for policies that are designed to cope with global environmental issues such as global warming (Barde, 1997).

4.2.1.3. Green Consumers

Other external stakeholders are in a position to place considerable pressure on firms. Consumers are becoming increasingly aware of environmental issues in their product purchases. A survey undertaken by Nielsen shows that there is more than 60% increase of green consumers to buy environmentally friendly products between 1991 and 1993 (Stern, 1994). Similarly, *the Economist* survey in 1990 demonstrates that many companies in Britain introduced green products because of their customers' tastes. Both industrial customers and end customers are demanding product stewardship - the cradle to grave management of products throughout the entire life cycle (Barry *et al.*, 1993; Gouldson, 1994; Hanna and Newman, 1995). Industrial customers, in particular, can influence their suppliers by requesting product and process information as new environmental regulations are introduced (e.g. British DIY firm, B&Q). Suppliers encourage corporate greening change by developing an infrastructure for the return, reuse, and recycling of containers and pallets (Angell, 1996).

In 1990 the British consulting firm, Sustainability, published its "green consumer guide", giving a star rating to companies and products. To be effective green, consumers need to be better informed about environmental cause and effect than is the average media receiver. Hence eco-labelling schemes have been introduced in many countries including Europe, North America and Asia. The eco-labelling scheme was launched in 1992. It considers the ecological impact of a product throughout the various stages of its life cycle, from the extraction of raw materials to its production, distribution, use and subsequent disposal. The scheme, which now covers about 300 products across 15 product groups[9], awards the European eco-label to products with a reduced environmental impact. In this way, by simply buying eco-labelled products, environmentally conscious consumers can provide the necessary impetus for producers to adopt more environmental friendly production processes. In the same way, purchases of eco-label products can be seen as a stamp of approval for producers who have made the effort to abide by the stringent criteria of the eco-label. Manufacturers are not forced to apply for the European eco-label. They make their own decisions, albeit under consumer pressure.

4.2.1.4. Stakeholders

The perspective of stakeholder theory argues that all stakeholders have the right to be treated fairly by an organisation, and that issues of differential stakeholder power are not

[9] Eco-label products groups are: tissue paper, dishwashers, soil improvers, bed mattresses, indoor paints and varnishes, footwear, textile products, personal computers, laundry detergents, detergents for dishwashers, copying paper, light bulbs, portable computers, refrigerators and washing machines.

directly relevant. According to Hasnas (1998), "stakeholder theory asserts that, regardless of whether stakeholder management leads to improved financial performance, managers should manage the business for the benefit of all stakeholders. It views the firm not as a mechanism for increasing the stockholders' financial returns, but as a vehicle for coordinating stakeholder interests, and sees management as having a fiduciary relationship not only to the stockholders, but to all stakeholders" (p.32).

Freeman and Reed (1983, p.91) define a stakeholder as: "Any identifiable group or individual who can affect the achievement of an organisation's objectives, or is affected by the achievement of an organisation's objectives." Clearly, many people can be classified as stakeholders if this definition is applied. For example, stakeholders include shareholders, government, media, employees, local communities and the environment. Clarkson (1995) sought to divide stakeholders into primary and secondary stakeholders. A primary stakeholder was defined as "one without whose continuing participation the corporation cannot survive as a going concern" (p.106). Secondary stakeholders were defined as "those who influence or affect, or are influenced or affected by, the corporation, but they are not engaged in transactions with the corporation and are not essential for its survival" (p.107). According to Clarkson (1995), primary stakeholders are the ones that must primarily be considered by management, and for the organisation to succeed in the long run, the organisation must be run for the benefit of all primary stakeholders.

A stakeholder's power to influence corporate management is viewed as a function of the stakeholder's degree of control over resources required by the organisation (Ullmann, 1985). Freeman (1984) discusses the dynamics of stakeholder influence on corporate decisions. A major role of corporate management is to assess the importance of meeting stakeholder demands in order to achieve the strategic objectives of the firm. Furthermore, as the expectations and power relativities of various stakeholder groups can change over time, organisations must continually adapt their operating and disclosure strategies. Roberts (1992, p.598) states: "A major role of corporate management is to assess the importance of meeting stakeholder demands in order to achieve the strategic objectives of the firm. As the level of stakeholder power increases, the importance of meeting stakeholder demands increases also."

According to Ullman (1985), the greater the importance to the organisation of the respective stakeholder's resources or support, the greater the probability that the particular stakeholder's expectations will be incorporated within the organisation's operation. From this perspective, various activities undertaken by organisations, including social or environmental reporting, will be related directly to the expectations of particular stakeholder groups.

Arguably, business management will be driven by both ethical considerations and performance based criteria. As Wicks (1996) argues, many people have embraced a conceptual framework in which ethical considerations and market considerations are seen as constituting categories. Wicks (1996) argues that this view is not realistic since it implies that people cannot introduce "moral imaginations when they act in the market world".

Other external stakeholders influencing corporate greening behaviour include the mass media (Lawrence and Morell, 1995), competitors (Meffert and Kirchgeorg, 1994) and industry standards (Hass, 1996).

According to Peattie (1990), an environmental response can be a way of catching up with competitors who have already gone green. For example, Every Ready's and Panasonic's response of launching mercury-free batteries, following Varta's innovative introduction (Peattie, 1990), demonstrates the effect of competitive pressures on the greening of firms. The competitors' environmental response brings increasing awareness for executives. As Nash (1990) notes, executives are more aware than ever before of green issues.

The external pressures mentioned above create a motivation for corporate greening effort, and Lawrence and Morell (1995) find that strong motivation is essential for a firm to become proactive in its greening management. In addition, initially reactive responses to external pressures can evolve over time into proactive responses to perceived opportunity (Angell, 1996; Halme, 1996).

4.2.2. Internal Drivers and Barriers

The unique business context within any firm influences the interpretation of external pressures into internal drivers for, and barriers to, greening change. Certainly, the degree to which management views external pressures as either threats or opportunities will influence the approach toward greening change (Jackson and Dutton, 1988).

4.2.2.1. Internal Drivers

The business context described above can persuade management to view external pressures as providing opportunities to increase economic returns and improve competitive position (Cordano, 1993; Hart, 1995; Stead and Stead, 1995), obtain cost savings, enhance the firm's image, and gain new products and markets (Lawrence and Morell, 1995). Managerial commitment to methods like total quality management (TQM) and improvements in environmental quality draws interest because costs can be reduced and productivity enhanced. A new acronym, TQEM, or Total Quality Environmental Management, suggests that the environmental performance improvements through TQEM is a top strategic priority (Post and Altman, 1992).

Most critical greening change activities begin within top management. Greening change often occurs at this level when upper management first begins to acknowledge the relevance and potential impact of external environmental pressures for their businesses. Many firms are experimenting with the development of an environmental vision and objectives (Dambach and Allenby, 1995). The leading firms are struggling with the definition of sustainability, and developing an understanding of how the sustainability concept will impact on their businesses (Gladwin *et al.*, 1995; Hart, 1997; Shrivastava, 1995, 1998).

4.2.2.2. Internal Barriers

As well as a positive change of attitude, however, the business context described above can alternatively influence management to view external pressures as posing a threat of: i) increased costs (Byrne and Deeb, 1993; Gouldson, 1994), ii) increased investment requirements (Bryne and Deeb, 1993; Girard and Perras, 1994), and iii) unstable and unpredictable markets (Gouldson, 1994). An organisation also may find that its established performance measurement does not reward greening behaviour, and therefore acts as a disincentive (Gabel and Sinclair-Desgagne, 1994). These threatening factors may bring internal resistance or indifference within business organisations. General resistance to change is often a barrier to new programmes (Shrivastava, 1995b). For example, resistance may be rooted in economic and knowledge barriers for technological transformation (Moors *et al.*, 1995). A resistance toward corporate greening would minimise the efficiency of an environmental management programme.

4.2.3. Operations Management

Much of the greening behaviour that occurs within firms falls under the jurisdiction of operations management. External environmental pressures can influence decision making about site locations, suppliers and procurement, and distributor relationships (Bowman, 1995; Hass, 1996; Stead and Stead, 1994; Taylor and Welford, 1993). Manufacturing processes offer some of the biggest opportunities for greening change. There are a variety of options to choose from. Re-engineering a process to be more environmentally sound may involve: eliminating toxic substances required in the current process, recycling or minimising process waste, modifying processes to accept secondary raw materials, and investing in new pollution prevention technologies (Angell, 1996). These aspects of operational management impact on economic and environmental performance (Porter and van der Linde, 1995).

4.2.4. Performance

The content of corporate greening can impact on economic and environmental performance. The current knowledge about these relationships and the types of measures which can be used, can be outlined in more detail.

4.2.4.1. Economic Performance

The relationship between environmental and economic performance remains unclear, although evidence is beginning to emerge that there is a positive relationship between proactive greening behaviour and the firm's financial situation. Stead and Stead (1995, 1996) have found that greening change activity results in reasonable financial returns and investment payback periods. Some scholars argue for the existence of an early mover advantage in strategic management (Porter and van der Linde, 1995; Shrivastava, 1995b). Klassen and McLaughlin (1996) report a positive relationship between the receipt of environmental awards and financial performance, with a corresponding negative relationship between environmental crises and financial performance. However, Jaffe *et al.* (1995) suggest that there is little evidence that environmental regulations impact economic performance at all. Walley and Whitehead (1993) support the view of Jaffe *et al.* (1995). They argue that environmental investments are too costly to gain return on investment within the short-term, say less than five to ten years. While the current financial year of corporations is yearly based, unclear outcomes of environmental investments in financial periods bring great uncertainty for decision-makers at board level. They also found that there are more executives who have a wait-and-see attitude than senior businessmen who take early steps towards environmental sustainability. Economic measures which have been studied include return on sales, return on assets, return on equity, market share and price premiums.

4.2.4.2. Environmental Performance

Corporate greening behaviour is generally considered to have a positive influence on environmental performance, although it is important to take a very broad view of performance to clearly understand this relationship (Starik, 1995; Stead and Stead, 1995).

Lober (1994) argues that the level of success of greening activities can be measured against organisational goals, system resources, and internal programmes. Researchers have been struggling to develop a comprehensive, clear measure of environmental performance that can be compared across industries in a quantitative manner. Sources used for environmental data include: toxic release inventory (TRI) (Hart, 1995), investor responsibility research centre's (IRRC), corporate environmental profiles (Hart and Ahuja, 1994), Dow Jones Sustainability Index. Quantitative measures include: ecological foot print per unit of product (Wackernagel and Rees, 1996), corporate green indices (Lober, 1996), percentage of waste recovered/recycled/sold/disposed of (Melnyk and Tummala, 1996), and amount of waste generated per $/Kg in sales (Swinth and Vinton, 1992). Qualitative measures used in the past include such self-reported measures as improvement in utilisation of waste by-products, risk of accidents, and frequency of non-compliance (Swinth and Vinton, 1992). The results of economic and environmental performance also need properly designed accounting and reporting systems to provide information to stakeholders including top executives and shareholders.

4.2.5. Environmental Accounting and Reporting

There are different levels of environmental reporting ranging from full disclosure to very limited disclosure. Stages have been identified for environmental reporting through which firms accede. In the first stage, companies produce glossy brochures highlighting their activities. In the final sage, firms produce a report targeted at an informed public. The report outlines the results of their environmental audit, the firms' environmental impacts over the year, their environmental targets, and the firm's success in meeting those targets including an indication of any infractions. Stakeholders are increasingly demanding greater disclosure (Gray *et al.*, 1993, 1996; Stern, 1994).

Deloitte Touche Tohmatsu International with the International Institute for Sustainable Development (1993 in Stern, 1994) undertook a survey of environmental reporting and indicated that they considered the highest level of environmental reporting to be one in which the social, economic, and environmental performance indicators are linked to sustainability. In a survey of 70 firms, only one had achieved the highest level.

With increasing concern about the validity of claims or misclaims, firms are often apprehensive of full disclosure. Full disclosure could lead to public scrutiny if targets are not appropriate or not achieved. For example, The Friends of the Earth have put together a Green Con Award. Elkington and Hailes (1989), among many others, have tried to raise public awareness of firms which are not being responsible environmentally by assigning firms shades of green. Many of us have witnessed, for example, the highly visible battle in which Jon Entine accused the apparently responsible company, The Body Shop, of not acting responsibly - of green gloss (*Business Ethics*, September, 1994).

The development of environmental accounting and reporting also facilitates green issues in financial stock market investment, in particular, in the US and UK. Dow Jones at New York Stock Exchange collected information on the social and environmental dimensions of listed companies, developed sustainability indicators, and announced the rank of sustainability based upon the indicators. Dow Jones' sustainability indicators provide social and environmental information to "socially responsible investors" or "ethical investors". According to Elkington *et al.* (1988), environmental investment funds have been growing rapidly as an increasing number of individual investors seek to fulfill a desire to invest in a way which reflects their personal convictions. In the UK, there were

32 such funds with the value of £440 million in 1992 (The Ethical Investment Research Service, 1992).

4.2.6. Environmental (Green) Marketing

A number of corporate greening activities can take place in the marketing arena, as well. Advertising and public relations (PR) can pursue eco-labelling options (Stead and Stead, 1994, 1996), and promote sustainable consumption practices (Shrivastava, 1995b). Policies relating to marketing mix, product range, brands, customer service, pricing, distribution, and new market entry are all open for adjustment when external environmental pressures and internal motivators are considered (Shrivastava, 1995, 1998; Stead and Stead, 1994, 1996).

The firm could also use their environmental reports as one element of its green marketing strategy. A firm engaged in environmental or green marketing develops market research activities and marketing strategies which inform consumers of the environmental attributes of the product in an effort to encourage the consumers to buy their product (Coddington, 1993; Welford and Gouldson, 1993). As part of the strategy, the firm can apply a number of techniques: the publication of environmental reports, eco-friendly packaging of products, eco-labelling of products or packaging, and the sale of eco-friendly products. The firm could also market their green policies through other techniques such as recycling points for glass, newspapers and plastics.

Ottman (1998) predicted the 21st century would be "greener than ever". According to her, consumers are demanding non-toxic products that are recyclable and environmentally friendly. Furthermore, there is a lucrative market for products that are responsive to the growing number of individuals with lifestyle concerns as environmentalism emerges as a social value (Ottman, 1998). In the popular and professional press, the terms "green marketing" and "environmental marketing" appear frequently and have received a great deal of discussion. For example, Connell (1994) presented current environmental claims and practices in marketing activities as shown in table 4.3. Recycled paper is increasingly used in packaging. Also reducing toxic materials such as lead in packaging is becoming popular in product design. Manufacturers demonstrate their environmental commitment by taking back consumed products for recycling.

Table 4.3. Environmental Claims and Practices

Packaging	**Product Design/Manufacture**	**Consumer Use**
Less packaging/ Packaging eliminated	Contains reduced levels of harmful or toxic materials (e.g., CFC-free, lead free)	Energy-efficient (e.g., autos, lights)
Recycled content, pre or post consumer	Recycled content for paper and other products	Product take-back to facilitate recycling
Recyclable or compostable	Cruelty-free (no animal testing)	Product reusability
Biodegradable	Concentrated products to reduce weight and waste	Product maintenance will be environmentally benign (e.g., CFC-free refrigerators, air conditioners)

Source: Connell (1994), p.363.

The American Marketing Association (AMA) in 1975 coined the term "ecological marketing" at its annual workshop. The AMA defined ecological marketing as: "the study of the positive and negative aspects of marketing activities on pollution, energy depletion and nonenergy resource depletion" (Henion and Kinnear, 1976b, p.1).

From a similar perspective, Henion (1979) used the term ecological marketing to describe the role and importance of green marketing in serving the long-term interests of companies (p.34). He continued his argument that green marketing can be considered a marketing strategy for the environmental crisis.

Polonsky (1994b) more recently attempted to define green or environmental marketing as: "green or environmental marketing consists of all activities designed to generate and facilitate any exchanges intended to satisfy human needs or wants, such that the satisfaction of these needs and wants occurs, with minimal detrimental impact on the natural environment" (Polonsky, 1994b, p.2).

This definition indicates that the interests of the business organisation and all its consumers are protected from irresponsible and harmful business activities. Also, the definition includes the protection of the natural environment, by attempting to minimise the detrimental impact on the environment. Polonsky (1994b) made two conditions clear for successful usage of green marketing. First, consumers want a cleaner environment and second, they are willing to pay for it, possibly through higher priced goods, modified individual lifestyles, or even governmental intervention. Meeting these conditions facilitates eco-friendly business activities or environmental marketing behaviours.

Polonsky's (1994a, 1994b) points bring more attention to board members or executives to consider green marketing in strategic management. However, the number of companies which decide to go green, will depend upon an evaluation of the opportunities and threats associated with proactive greening behaviour versus reactive greening behaviour (Peattie, 1992).

4.2.7. Corporate Environmental Management Initiative Characteristics

The main characteristics which affect a firm's corporate greening effort include strategic plans, level of organisational commitment, and utilisation of environmental management tools. Corporate environmental strategies have in general ranged from reactive to proactive in nature (Hunt and Auster, 1990; Roome, 1992).

Organisational commitment to environmental management can be demonstrated by the "mindset" of top-management, commitment of resources, the establishment of an environmental affairs department, and top management support and involvement (Hunt and Auster, 1990). A business organisation which regularly engages in environmental audits, life cycle assessment (LCA) and international standard ISO14001 is more likely to maintain a proactive greening change programme (Hunt and Auster, 1990; Roome, 1992; Post and Altman, 1992).

Important characteristics of an environmental management programme include: the level of formality, the existence of training programmes, integration with other functions (Swinth and Vinton, 1992), the nature of reporting relationships (Hunt and Auster, 1990; Post and Altman, 1992), and the existence of performance objectives (Hunt and Auster, 1990). Table 4.4 summarises these findings and shows examples of these characteristics in environmental management programme.

Table 4.4. Characteristics of Environmental Management Programmes

Characteristics of Sound Environmental Management Programmes	Examples
• Formality	• Formal environmental policy statement
• Training Programme	• Environment, health and safety programme
• Integrative approach	• Developing environmental marketing strategy with R&D and Marketing department
• Reporting	• Separate environmental report and financial report
• Performance targets	• Economic and environmental performance targets

Many firms, which are developing an environmental management programme, are working to certify under a variety of environmentally oriented operating standards such as BS7750 (Rothery, 1993; Hillary, 1999), EMAS (Blau, 1995; Hillary, 1999), and ISO 14001 (Blau, 1995; Sarkis, 1995; Hillary, 1999). The efforts to obtain environmental standards certification can also include risk management, environmental audits, life cycle assessment, and the development of information systems for tracking environmental data (Black, 1997; Post and Altman, 1992; Shrivastava, 1995; Taylor and Welford, 1993).

Figure 4.1. Overview of Corporate Environmental Management

Based upon the issues discussed above, Figure 4.1 presents overview of corporate environmental management. It indicates that once top executives perceive green environmental uncertainty caused by external factors including environmental legislation, consumer demands and stakeholder expectations, top executives' commitment on green issues can encourage corporate greening concerns and behaviours in different departmental areas. These include strategic management, operation management, accounting and reporting, marketing. Corporate greening can be marginalised or maximised, it depends upon top executives' commitment. If they commit themselves more on green issues, corporate greening can be of the proactive type. If they simply ignore green issues, corporate greening can be a more reactive type. As a result, corporate economic and environmental performance will be influenced by the type of corporate greening strategy based upon the level of top executives' commitment.

Appendix 4.1 provides ten different topics of corporate environmental management literature.

4.3. Conclusion

This chapter reviewed ten different aspects of corporate environmental management. Each aspect of corporate environmental management has reviewed a range four to nine, total sixty four literatures are reviewed and categorised under external pressures, internal drivers and barriers, operations management, environmental accounting and reporting, environmental marketing, corporate environmental management initiative characteristics. In corporate environmental management, top executives' commitment is crucial to include green issues in the organisational system. If staff within the organisation perceives top management as uncommitted or as compromising the organisation's ability to achieve its environmental objectives, then such attitudes are likely to become accepted throughout the organisation. Therefore, as a response to green environmental uncertainty, proactive or reactive greening behaviour is heavily dependent upon top executives who judge the seriousness with which an organisation takes its green commitment.

Chapter Five

The Korean Chemical Industry

5. 1. Introduction

This chapter provides a general understanding of the Korean chemical industry and its structure. The Korean chemical industry comprises the petrochemical, the fine chemical, pharmaceuticals, cosmetics, paints, and agrochemicals. As an industrial response to green issues, the Responsible Care Programme in the chemical industry is described in the Korean industry context. In addition, in order to obtain a better understanding of green issues in Korean industry, reference is made to a previous empirical survey of corporate environmental management carried out by the author.

5.1.1. The Rationale

The chemical industry has one of the longest industrial histories in Korea. In 1997, total production in the chemical products industry, total sales and total profitability increased by 10%, 11.5% and 1.4% respectively. In 1997, total exports amounted to US$115.2 billion and imports amounted to US$25.2 billion. Since March 1998, excess capacity and international competitiveness have brought pressure from the government to restructure the industry. As a result of the government-initiated industrial restructuring drive, mainly aimed at eliminating overlapping businesses, the three national industrial complexes at Daesan in South Chungchong Province, Yeochon in South Cholla Province, and Ulsan in South Kyongsang Province were slated for restructuring under a series of mergers and asset swaps among the top five *chaebols*. In addition, the government has a mandate to set environmental standards and to investigate environmental pollution. For example, environmental impact assessment (EIA) is a compulsory part of environmental management in the industry. The Korea Environment Institute, as one of the main government institutions that specialises in reviewing environmental impact assessment documents and development and distribution of assessment techniques. Those who prepared false EIA reports will be subject to criminal punishment.

The industry has begun to be aware that green issues are not only international but also result from domestic pressure. Thus, investment in environmental technology and pollution reduction facilities has increased. However, the traditional strategy for environmental investment involves complying with minimum regulation standards. If we remind ourselves that the major source of international competitiveness of Korean chemical industry has been from relatively cheap labour, increasing environmental investment to meet stricter environmental regulation can be an obstacle for gaining competitiveness in international markets. However, executives of the industry seem to have reconsidered the importance of corporate environmental management. How environmental management can bring benefits to the industry was discussed at the annual meeting of the chemical industry association in 1998. The main outcome of the meeting was to promote high environmental standards and take proactive steps in corporate environmental management. This agreement was of great interest to the author who has a number of contacts in the industry as well as relevant industrial consulting experience. Also, it is practically important for conducting research that a significant number of the chemical industry associations and confederations are located in Seoul, Korea.

5.2. General Background

The Korean economy grew by 7.4 percent annually during the 1990-1996 period (The Bank of Korea, 1997). The major feature of Korean economic growth in the 1990s was that its industrial structure became further sophisticated, with a rising share for the service sector as well as heavy and chemical industries. This structural realignment helped to enhance international competitiveness in manufacturing industry, especially in the heavy and chemical industries which had deteriorated as a result of rapid wage increases and the emergence of other fast-developing countries with lower labour costs. Despite the shift into services, the heavy and chemical industries continued to dominate the growth of the manufacturing sector throughout 2000. The proportion of this industry in total manufacturing industries increased to 76.2% percent in 1996 on current GDP basis, compared with 69.4 percent in 1992 (The Bank of Korea, 1997).

In addition to strengthened international competitiveness, the Korean chemical industry has also rapidly increased its overseas direct investments since the 1980s. Overseas investments contributed to Korean firms' expanding share in the world market and acquisition of advanced technology in capital-intensive industries, while actively practicing localisation and globalisation at the same time.

However, the future economic growth and further globalisation of Korean industry have been obstructed by an ever widening trade deficit, high costs and relatively lower levels of technology. Also, developing countries including China and Malaysia are rapidly chasing Korea with relatively cheap labour and low technology. Thus, international market competitiveness is becoming very high.

5.3. The Chemical Industry in Korea

5.3.1. The Petrochemical Industry

The petrochemical industry is the source of an array of synthetic products ranging from detergents, fibres used in clothing and carpeting to shopping bags, clear packaging films and car dashboards, petrol tanks, seats and bumpers. The industry in Korea has made significant progress during the last two decades. At the end of the 1970s Korean petrochemical facilities were no more than a naphtha cracker with an annual ethylene capacity of 155 thousand Metric Ton (MT) and its downstream plants. However, since the large-scale construction of new plants and other expansion projects in the 1980s, Korea has become a prominent petrochemical-producing nation with an annual ethylene capacity of 4,920 thousand MT and various downstream plants (Korea Petrochemical Industry Association, 2000).

Korean petrochemicals made further significant progress, especially in the supply sector, during the 1990s. The industry's growth had been backed mainly by high demand from allied industries such as automobiles, electronics, textiles and other durable consumer goods. After a sudden capacity expansion during 1990-1991, followed by over-capacity and difficult years of flat earnings, the industry entered a second investment boom in the 1990s with favourable prospects for exports and the creation of vertically integrated production systems. This led the industry to become the world's fifth largest producer of petrochemicals in 1996.

Table 5.1. Supply and Demand for major Petrochemicals

(in thousand tons)

		1992	1993	1994	1995	1996	1997	1998	1999 1~6*
Supply	Production	6,799	7,607	8,245	9,063	10,290	12,491	13,405	7,073
	Imports	994	1,075	1,194	1,255	1,297	1,298	952	654
Demand	Domestic Demand	5,635	6,185	6,915	7,228	8,007	8,902	7,682	4,577
	Exports	2,158	2,497	2,524	3,090	3,580	4,887	6,675	3,150

Note: Major petrochemicals cover synthetic resins, synthetic fiber raw materials and synthetic rubbers.
*An average between January and June in 1999.
Source: Korea Petrochemical Industry Association (1999)

Domestic needs for the three major petrochemical sectors – synthetic resins, synthetic fibres raw materials and synthetic rubbers – have been growing annually. In synthetic resins, domestic demand increased at a stable annual growth rate of 6.8 percent during 1992-1996, reaching 3.9 million tons in 1996. For example, demand for acrylonitrile butadiene styrene (ABS) increased by 12.4 percent and polyvinyl chloride (PVC) increased 7.5 percent per annum (Korea Petrochemical Industry Association, 1997). Also, exports into Asian countries such as China, Hong Kong and Taiwan have grown dramatically although low international prices kept export values low.

In synthetic fibre raw materials, demand largely depends upon the associated fibres and textile industries. Among the major synthetic fibre raw materials, terephtalic acid (TPA) and ethylene glycol (EG) played a leading role in the demand increase during 1992-1996 because of a boom in exports of polyester products. Domestic demand for TPA and EG increased by 11.9 percent and 13.4 percent annually during 1992-1996, respectively (Korea Petrochemical Industry Association, 1997).

Domestic demand for synthetic rubbers, used as basic materials in products such as tyres, footwear and belts, has grown more slowly over the past five years. For example, domestic requirements for styrene butadiene rubber (SBR) rose by 6.2 percent during 1992-1996, to 140,000 tons in 1996, mainly because of increases in demand for tyres in allied industries such as automobiles.

Table 5.2. Supply and Demand for major Petrochemical derivatives

(in thousand tons)

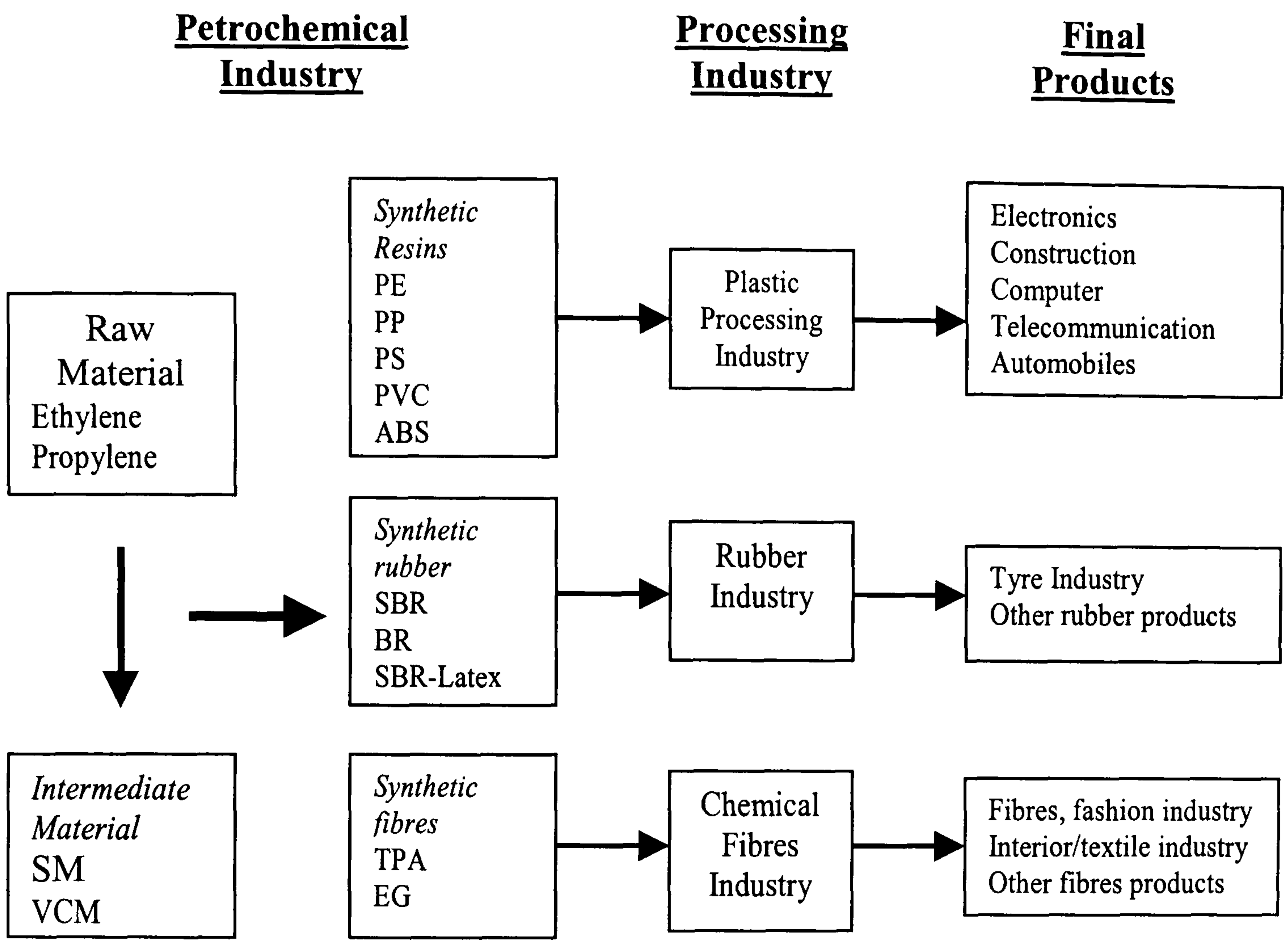
		1992			1996		
		Synthetic Resins	Synthetic Fibres Raw Materials	Synthetic Rubbers	Synthetic Resins	Synthetic Fibres Raw Materials	Synthetic Rubbers
Supply	Production	4,792	1,799	208	6,791	2,915	334
	Imports	161	786	47	163	1,113	23
Demand	Domestic demand	3,037	2,426	172	3,944	3,600	214
	Exports	1,916	159	83	3,010	428	143

Note: Synthetic Resins include LDPE, HDPE, PP, PS, ABS, PVC; Synthetic Fibres Raw Materials include AN, CPLM, TPA, EG; Synthetic Rubbers include SBR and BR (refer abbreviations).

Source: Korea Petrochemical Industry Association (1999)

Figure 5.1 shows the petrochemical manufacturing flow from raw material to final products. The petrochemical industry plays one of the key suppliers' roles in allied industries. The industry produces raw material and intermediate material as well as synthetic resins, synthetic fibres and synthetic rubbers.

Figure 5.1. Petrochemical products and processing products manufacturing flowchart



Source: Korea Development Bank (1999) Industrial Report, p.7

Abbreviations

AN: acrylonitrile
SM: styrene monomer
VCM: Vinyl chloride monomer
PE: polyethylene
PP: polypropylene
PS: polystyrene
PVC: polyvinyl chloride
LDPE: low density polyethylene
CPLM: caprolactam
ABS: acrylonitrile butadiene styrene
SBR: styrene butadiene rubber
BR: butadiene rubber
SBR-Latex: styrene butadiene rubber-Latex
TPA: terephthalic acid
EG: ethylene gylcol
HDPE: high density polyethylene

Despite the quantitative growth in exports, the profitability of petrochemical companies, in general, deteriorated over the past five years, because of a worldwide over-supply accompanied by declining international prices. It appears that the industry in Korea in the 1990s is confronted with worldwide oversupply, fierce competition and the costs of environmental regulation.

Traditionally, the petrochemical industry's competitiveness has been determined by low and stable raw material prices. In corporate financial statements, raw material costs consist of 70-80% of production costs. Thus, the US and Middle East countries which have abundant oil resources showed high competitiveness. In addition, old facilities have high variable costs while new facilities have high fixed costs relatively (Table 5.3 and 5.4).

Table 5.3. Production Cost in Petrochemical Industry

(in dollars per ton)

	Ethylene		High density polyethylene	
	Old facilities	New facilities	Old facilities	New facilities
Variable Cost	234	231	415	410
Fixed Cost	34	229	34	182
Overhead	12	12	10	10
Total Production Cost	280	472	459	602

Source: Daelim Industry interim report (1999)

Table 5.4. The comparison of production cost among major manufacturing countries

(in dollars per ton)

			Variable Cost	Fixed Cost	Over-head	Total (US$/MT)
Ethylene	Korea	New Facility	231	229	12	472
	Japan	New Facility	232	242	16	490
	US	New Facility	129	202	22	353
High density polyethylene	Korea	New Facility	610	182	10	802
	Japan	New Facility	628	194	15	837
	US	New Facility	480	162	13	655

Note: Old facilities are excluded.
Source: The U.S. National Petroleum Refiners Association (1999)

5.3.1.1. Challenges for the Petrochemical Industry in Korea

Statistics in supply and demand, and exports and imports show that the Korean petrochemical industry is becoming competitive. Although the industry has been cost and price competitive, the lack of core technology remains a major stumbling block in the long term. In the general-purpose products market, Korea's petrochemical industry has world-class manufacturing technology. However, slow progress in new process development and production process improvements represents a major obstacle to advancing core technologies.

In developed countries, the focus is on restructuring and rationalisation instead of expanding capacity for general-purpose products, in order to counter limitations to demand growth in the future. They will transplant facilities to low cost regions such as China, India or other developing nations; here they will specialise in high-grade and fine chemicals. One example of this is the UK chemical firm ICI's exit from petrochemicals. In developing regions like China and East Asia, rapid expansion of their capacities are expected. For example, the petrochemical industry in Korea has focused on capacity expansion and rationalisation rather than research and development (Table 5.5). Thus, as far as Korea is concerned, the following issues can be summarised as challenges for the future:

(1) Increasing cost competition from developing countries in Asia

(2) High value-added products from other developed countries

(3) International and domestic environmental regulation

(4) International environmental initiatives such as Responsible Care, ISO 14000, BS 7750

Table 5.5. Major Investment Issues in Petrochemical Industry

(in 100 million won)

	1996	1997	1998	1999
Capacity Expansion	24, 838	28, 204	4, 076	2, 849
Rationalisation	4, 236	2, 597	2, 551	2, 730
Pollution Treatment	1, 544	443	447	329
Research & Development	541	414	309	360
Total	31, 159	31, 658	7, 383	6, 268

Source: Korea Industrial Bank (1996-1999)

5.3.3. The Fine Chemical Industry

Fine chemical industry manufacturers cover various kinds of products using substances extricated from petrochemicals and other basic chemicals as intermediate and raw materials. Fine chemical products mainly cover pharmaceuticals, cosmetics, paints and agrochemicals. Some products such as pharmaceuticals and cosmetics, are directly for end-user consumption, while others such as agrochemicals, paints and dyestuffs are inputs into other industries or products for their value-added improvements. The industry is characterised as technology- and knowledge-intensive, high value-added and resource and energy efficient.

The Korean fine chemical industry enjoyed significant growth in the 1980s, mainly backed by high growth in demand from allied industries. Entering the 1990s, the industry has showed an annual growth rate of over 10% in domestic demand. Sustained growth is attributed to the development of new products through technological advances, diversification of demand, and consumers' preference for high quality goods and materials.

However, the industry is facing considerable changes as a result of global environmental regulations, more strict protection of patents and copyrights and increasing international competition. One of main difficulties which the industry has is how to develop environmentally less hazardous production processes and products without losing cost and market competitiveness.

5.3.3.1. Pharmaceuticals

Pharmaceuticals, the largest sector with Korean chemical industry, accounts for about 33 percent of the fine chemicals market.

Table 5.6. Supply and Demand for Pharmaceuticals

(in million US dollars)

		1992	1993	1994	1995	1996
Finished Drugs	**Production**	5, 118	5, 412	6, 106	7, 310	7, 891
	Imports	112	142	161	208	228
	Domestic demand	5, 179	5, 500	6, 217	7, 455	8, 008
	Exports	51	54	50	63	111
Raw Materials	Production	339	362	390	496	527
	Imports	396	437	530	619	697
	Domestic demand	527	553	616	771	875
	Exports	208	246	304	344	349
Total	Production	5, 457	5, 774	6, 496	7, 806	8, 418
	Imports	508	579	691	827	925
	Domestic demand	5, 706	6, 053	6, 833	8, 226	8, 883
	Exports	259	300	354	407	640

Source: Korea Pharmaceutical Manufacturer's Association

As Table 5.6 shows, domestic demand for pharmaceuticals is growing annually. In order to meet the rise in demand, the installation of production facilities to qualify for "Korea Good Manufacturing Practice (KGMP)" was established in 1985. Production capacities expanded rapidly, and the quality level of commodities, on the whole, was considerably raised.

5.3.3.2. Cosmetics

The cosmetics industry continued to maintain high growth in the 1990s. Production of cosmetics soared by 18.3 percent annually during 1992-1996. This high growth was attributed mainly to producers' development of new commodity types and special make-up products, focusing on a new class of demand. Another factor behind the increased production was consumers' preference for special-use and high quality products. This, naturally, resulted in a rise in prices, and hence overall value of sales (Table 5.7).

Table 5.7. Cosmetics Production by Item

(in billion won)

	1992	1993	1994	1995	1996
Child-care Products	24	30	39	39	45
Bath Preparations	1	2	18	22	28
Eye Cosmetics	59	69	101	112	129
Fragrances	35	36	41	52	64
Hair-care Cosmetics	218	253	315	319	360
Hair-colouring Preparations	2	3	5	8	7
Make-up Cosmetics	209	255	369	412	443
Manicures	10	11	11	12	14
Shaving Products	113	78	134	154	142
Skin-care Products	633	853	989	1, 065	1, 225
Suntan and Sunscreen Products	54	88	113	191	207
Total	1, 358	1, 678	2, 135	2, 386	2, 664

Source: Korea Cosmetics Industry Association

Despite rapidly growing exports during the 1992-1996 period, however, the industry faced increasing international competition and exporters have experienced difficulties in raising market share since 1995. Imports have also steeply increased since 1993. This sharp increase was due to the opening of domestic retail markets as well as high dependency on imported raw materials.

5.3.3.3. Paints

The success of the paint industry is closely tied to the production activities of allied industries such as construction, automobiles, shipbuilding and electronics. These industries require extensive use of paints as decorating materials. In Korea, the construction sector, in particular, provides the largest demand for paints and plays a leading role in the industry's growth (Table 5.8).

Table 5.8. Supply and Demand for Paints

(in tons)

	1992	1993	1994	1995	1996
Production	685, 370	730, 180	822, 804	890, 297	949, 892
Imports	17, 293	17, 477	23, 838	27, 952	33, 179
Domestic demand	673, 773	714, 809	797, 710	859, 843	930, 490
Exports	28, 890	32, 848	48, 932	58, 406	52, 581

Source: Korea Paint and Ink Co-operative, The Office of Customs Administration

By product, production of industrial paints such as power coatings, inorganic coatings and epoxy resin paints has grown more rapidly than other paint such alkyd resin enamels and varnishes. One of the major changes in products is that water-based paints have replaced oil-based paints, resulting in widespread awareness of environmental protection issues. As the paint industry has come under pressure to reduce so-called volatile organic compound (VOC) emissions in recent years, major producers have strengthened R&D activities to surmount this problem.

5.3.3.4. Agrochemicals

Agrochemicals are defined as chemicals that regulate the physiological function of crops or get rid of harmful germs, insects or weeds. They fall into four broadly defined groups: germicide, pesticide, weedicide and others. The growth of the agrochemical industry is closely associated with changes in the agricultural environment. The agrochemical industry in Korea achieved high growth until the early 1980s due to the government programme for increasing agricultural production. However, as land available for cultivation decreases gradually, and use of agrochemicals is restrained because of prevailing environmentally friendly methods of cultivation, the industry experienced downward sloping supply and demand since the late 1980s (Table 5.9).

Table 5.9. Supply and Demand for Agrochemicals

(in tons)

		1992	1993	1994	1995	1996
	Production	199, 153	168, 346	154, 746	161, 183	162, 000
	Imports	1, 583	1, 638	1, 486	1, 644	1, 808
Finished Products	Domestic demand	200, 281	169, 786	155, 900	162, 327	163, 358
	Exports	455	198	332	500	450
	Self-sufficiency Rate	99.4	99.2	99.3	99.3	99.2
	Production	21, 044	21, 174	19, 698	19, 399	20, 369
	Imports	13, 906	14, 606	14, 064	12, 132	13, 000
Raw Materials	Domestic demand	31, 415	31, 272	28, 277	26, 049	28, 161
	Exports	3, 535	4, 508	5, 485	5, 482	5, 208
	Self-sufficiency Rate	67.0	67.7	69.7	74.5	72.3

Source: Korea Agricultural Chemicals Industrial Association

5.3.3.5. Challenges for the Fine Chemical Industry

Since fine chemical technology has two aims – to create new materials or produce raw materials, and to make finished products – developing technological know-how is the key factor in competitive world markets. Although the Korean fine chemical industry has made considerable progress in general-purpose finished products, there is still a lack of sophisticated technology for producing core raw and new materials. According to the Ministry of Trade, Industry and Energy (1999), large chemical companies have invested in expanding petrochemical facilities rather than R&D activities in the fine chemical sector. In addition, international environmental standards such as British Standard (BS) 7750 and International Standardization Organization (ISO) 14000 series bring attention to stricter environmental regulations and the development of more environmentally friendly new materials and catalysts less harmful to the natural environment.

5.4. The Responsible Care Programme

5.4.1. Background

According to the *Financial Times* (3rd July 2000), the driving forces in the chemical and process industries are (1) the loss of traditional bulk chemical manufacture to the developing world and (2) the emergence of new technologies for the manufacture of higher added-value products. Cheaper labour costs and easier permission to operate in the Middle East, Asia, and Latin America accelerate the move from Europe and the U.S. In addition, environmental pressures in Europe put pressure on many large-scale manufacturers to relocate their plants in friendlier places.

Non-governmental organisations are becoming increasingly ferocious. In April 2000, the European Environmental Bureau (EEB) and the European Consumers Organisation (BEUC) presented a policy discussion paper "Chemicals under the spotlight – from awareness to action" to the European Parliament. Also, the public and the media influence the industry's end users. For example, Nike and McDonald decided to ditch PVC and polystyrene respectively.

Moreover, in the global market, environmental regulation and agreement are becoming allied internationally. This business context makes for more competitive markets. Since global attention is given to the chemical industry with regard to environmental issues, the Korean chemical industry also pays attention to international voluntary programmes in chemical industries around the world. Perhaps the most influential of these is the "Responsible Care" programme.

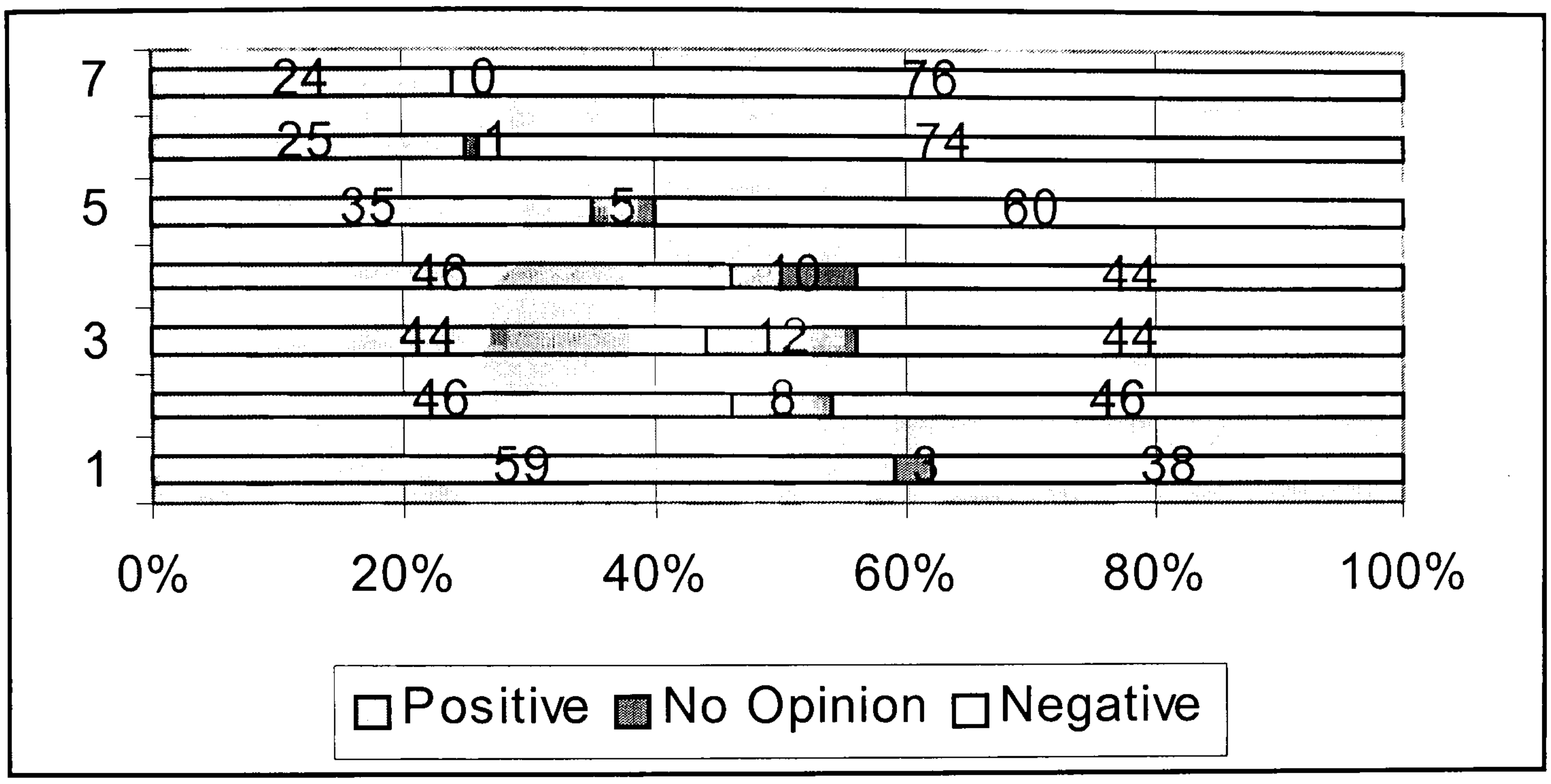
5.4.1.1. Responsible Care in the Chemical Industry

In the US, the Chemical Manufacturers' Association, representing about 90% of US chemical production, launched the Responsible Care programme in 1988. The outcomes of Responsible Care have been substantial, for example chemical emissions reduced by 58% between 1988 and 1997 (though apparently only 66% of the US industry's own employees are aware of the initiative) (*Financial Times*, 3rd July 2000).

The background of Responsible Care can globally be traced to the wider perception of the industry. For example, *Business Week* noticed the problems with the chemical industry's public image: The chemical industry now ranks lowest in image of 13 industries surveyed by New York Pollster Yankelovich, Skelly & White, Inc. "The gap between the chemical industry and the one ranking second-last is quite large," says Laurence D. Wiseman, a Yankelovich vice-president (October 8, 1979, p.73). Similarly, The tragic accident at Bhopal, India in November 1984 triggered public outrage against chemical industry in general. This accident seriously damaged legislators' and the public's perceptions of the chemical industry around the world.

More recently, CEFIC's (the European Chemical Industry Council) pan-European survey in 1998 shows the general public's image of the chemical industry in Europe. For example, France (76%), Spain (74%) and Belgium (60%) respond that the chemical industry impacts on the natural and human environment harmfully. Interestingly, only Germany (59%) shows that the chemical industry provides useful goods and services with little environmental impact. Germany's response perhaps implies that the benefits, which the chemical industry brought, may offset the damaged natural environment. Netherlands, Great Britain and Italy show more or less the same opinion of the industry's image (Figure 5.2).

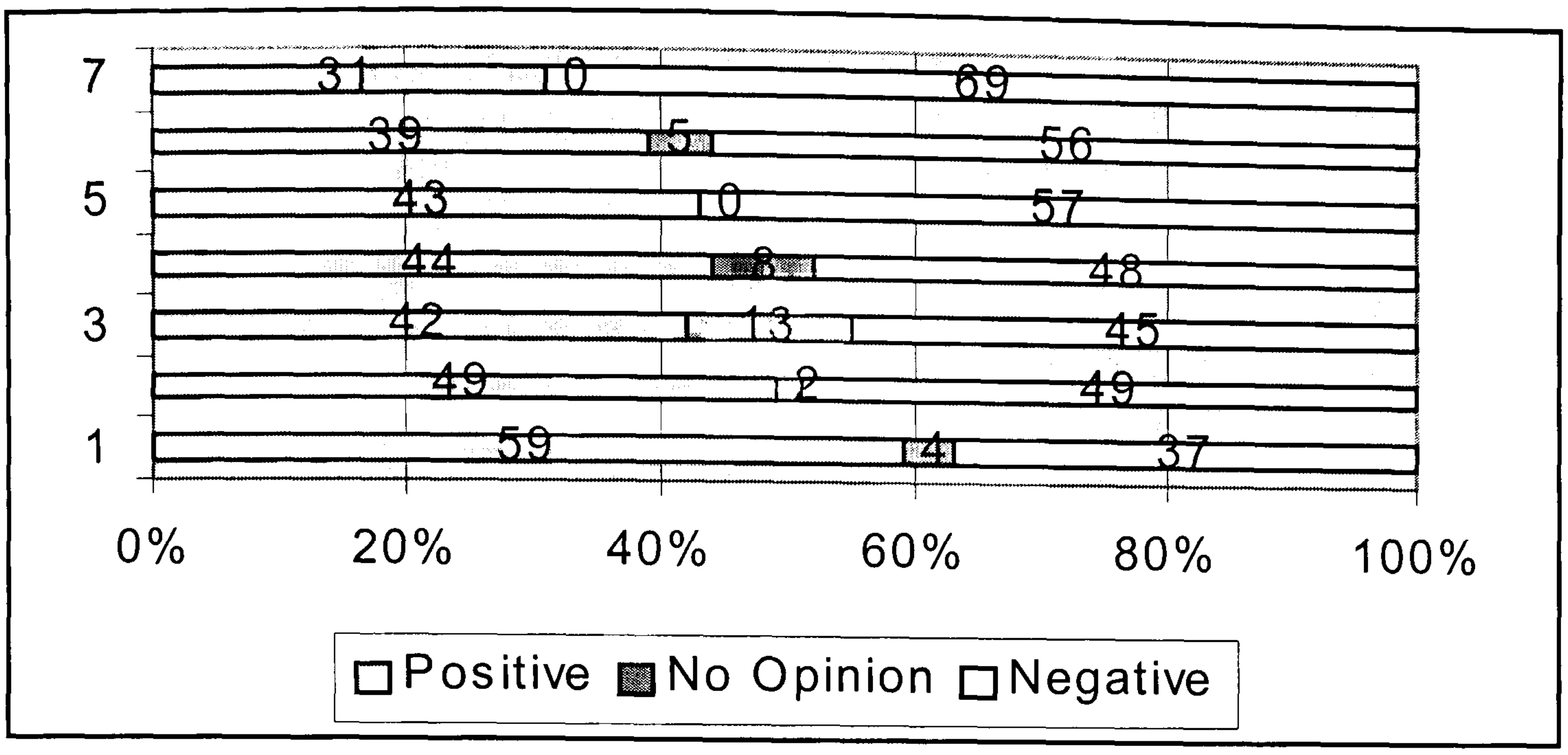
Figure 5.2. Overall Opinion of the Chemical Industry (1998)



[1: Germany, 2: Netherlands, 3: Great Britain, 4: Italy, 5: Belgium, 6: Spain, 7: France]

CEFIC's pan-European survey in 2000 shows a slow but broad and continuous decline in the chemical industry's reputation. France (69%), Spain (56%) and Belgium (57%) have more sceptical and negative images of the chemical industry. Respondents believe the chemical industry damages the natural environment and living conditions. However, the public image of the chemical industry in France and Spain is improved. Compared to 1998 survey, 18% of positive response in Spain and 7% in France are increased. Interestingly, only Germany (59%) retains the same opinion "the chemical industry enriches our standard of living with minor environmental damages" with more than 50% response to the industry among other selected countries. Netherlands and Great Britain show 49% and 45% positive response respectively (Figure 5.3).

Figure 5.3. Overall Opinion of the Chemical Industry (2000)



[1: Germany, 2: Netherlands, 3: Great Britain, 4: Italy, 5: Belgium, 6: Spain, 7: France]

Since global warming became a major political issue in Rio de Janeiro in 1992 and the developed countries adopted Agenda 21, the chemical industry responded and supports the goal of sustainable development. Under legislators' and the public pressure, the Canadian Chemical Producers' Association (CCPA) established *Responsible Care* in 1985. According to CCPA (1999), Responsible Care aims at:

"continuously improving all aspects of the chemical industry's environmental, health and safety performance and ensuring openness in communication about its activities and its achievements" (Responsible Care Report, 1999, p.1.).

The early stages of implementing *Responsible Care* in Canada focused on providing guiding principles and a statement of policy on *Responsible Care*, with particular emphasis on product stewardship. In the US, the Chemical Manufacturers Association (CMA) launched a similar initiative including the development of a community awareness and emergency response code in 1985. Since *Responsible Care* launched in

1988, the programme is an obligation of membership in the American Chemistry Council (ACC), and the following conditions must be met:

Organisations must

- Continuously improve their health, safety and environmental performance
- Listen and respond to public concerns
- Assist each other to achieve optimum performance
- Report their goals and progress to the public

It is interesting to note that the initial response in the U.S. focused more on public concerns whereas the Canadian response was to direct its immediate attention to the technical aspects of the Bhopal incident.

Responsible Care came to Europe in 1989 through the United Kingdom and then spread over all European countries where CEFIC, the European Chemical Industry Council, has member associations. Similarly, the other members of the International Council of Chemical Associations (ICCA) established and developed Responsible Care programmes.

In Europe, CEFIC leads *Responsible Care.* CEFIC represents national chemical federations and chemical companies in 22 European countries (Appendix-1). CEFIC plays a mediator role between the industry and EU institutions such as the European Commission and the European Parliament.

The International Council of Chemical Associations (ICCA) also supports *Responsible Care* to obtain more international attention and awareness. *Responsible Care* covers 45 countries and 85% of world chemical production; 59% of its key features are in operation around the world (CEFIC Annual Report 1999). In 1990, ICCA organised the Responsible Care Leadership Group (RCLG) to spread the *Responsible Care* programme worldwide[10]. At present, 45 countries have joined ICCA/RCLG. The action plan of Agenda 21 at the Rio Earth summit in 1992 points to the *Responsible Care* programme as the most effective worldwide movement in the global chemical industry. Even the United Nation's Environmental Programme (UNEP) confirmed the importance of *Responsible Care* in the global chemical industry.

However, there have been critiques. According to Barnard (1990), "responsible care to date appears to reflect more public relations than progress" (p.35). He continues his argument that CMA introduced the *Responsible Care* programme without accompanying the codes of management practice. Moreover, development of the management codes is not intended to be enforced. That is, there is no timetable for compliance with the codes. Thus, there will be no action against or sanction on CMA members who fail to achieve compliance. Since the programme is based upon self-evaluation and voluntary commitment, there might be limits to its effective application in the chemical industry.

5.4.1.2. Responsible Care programme in Korea

Although *Responsible Care* is a voluntary initiative, it is under direct and indirect pressure from governments, and international organisations (e.g. ICCA, CMA). Since the implementation of *Responsible Care* is in the hands of the national chemical industry associations and member companies, the degree of representativeness of national chemical industries is important for joining ICCA/RCLG. In 1993, the Korea Petrochemical Industry Association (KPIA) obtained agreement over the guiding principles of *Responsible Care* from 38 member companies, and attempted to implement

[10] ICCA has three functional sub-groups: Responsible Care Leadership Group (RCLG), International Trade Group (ITG) and Technical Affairs Group (TAG).

the programme. However, ICCA rejected KPIA's *Responsible Care* programme because KPIA does not represent the whole Korean chemical industry.

Since then, the chemical industry in Korea has voluntarily developed its capability, obtaining international certification such as ISO 14000 and BS 7750. Even the government welcomed and encouraged these industry moves through panel discussion and economic incentives such as tax release. The Korean chemical industry itself seems to believe that it has strong commitment with regard to environmental issues and their management (Table 5.10). For example, among major industries in Korea, the chemical industry shows the highest investment in environmental pollution and the biggest number of experts.

Table 5.10 Environmental Investment and Situation in Korean Industry

Issue	Top Rank 1	Top Rank 2	Top Rank 3
Expert group at Environmental Department	**Chemical Industry**	Steel Industry	Automobile Industry
ISO 14000	Telecommunication equipment Manufacturing Industry	**Chemical Industry**	Steel Industry
Investment in Environmental Pollution	**Chemical Industry**	Non-Steel Mine Manufacturing Industry	Steel Industry
Environmental Auditing system	**Chemical Industry**	Non-Steel Mine Manufacturing Industry	Steel Industry

Source: Korea Petrochemical Industry Association (KPIA)

As the ICCA admitted (ICCA, 1996), many multinational companies in Korea, as a non-member country of ICCA, demonstrated their commitment to the *Responsible Care* programme. In 1998, different national chemical industry associations, member companies and other institutions agreed to launch the Korea Responsible Care Council

(KRCC). A total of 70 companies and institutions are involved in KRCC. In 2000, KRCC launched its own *Responsible Care* programme with 64 chemical companies and 6 associations and institutions.

A previous empirical survey by the author is introduced for a better understanding of environmental issues and Korean industry in general.

5.5. Empirical Questionnaire Survey of Corporate Environmental Management: Korean Industry Context[11]

5.5.1. General Background

The survey aimed to identify i) what kind of environmental initiatives do companies have, if any? ii) what are current drivers of those environmental initiatives? iii) with 5 years time, what are future drivers of those environmental initiatives?

The findings from this survey explored the industrial perceptions of environmental initiatives and the main drivers of decision making for those initiatives.

Information on the current environmental management situation in Korean companies was sought and obtained from a questionnaire-based survey. A total of 9 industrial sectors were covered in the survey. These were, textile industry, wood and furniture industry, pulp and paper industry, chemical industry, metal and engineering industry, electronics industry, rubber and plastics industry, electricity, gas, and water supplies and construction industry.

[11] For more detail, see K.H.Lee (1999) *Business Perceptions to Green Issues; Korean Industry Context*, Working Paper, University of Stirling, Stirling, UK.

A sample of 500 firms was selected randomly from the Korean Industry Directory/Korean Companies database. In March 2000, a total of 500 questionnaires were distributed, and 163 effective questionnaires were returned by May 2000. The overall response rate was 32.6%. A questionnaire with 5-point Likert scales was designed, and statistical analysis was based on frequency tables.

More than two thirds of Korean companies are relatively large, what we call *Chaebol*. This survey result confirms the characteristic size of *Chaebol* in Korean industry. Eighty-six percent of responding companies had more than 500 employees. As an indicator of company size, the number of employees was used. In particular, heavy investment industries such as the chemical, electricity and electronics industries showed high employment levels between 2,000 and 20,000. Not surprisingly, the size of companies was reflected in the scale of annual turnover. More than 80% of responding companies ranged between 100 billion Korean won and 999 billion Korean won[12], and many respondents were from major export oriented industries such as Chemicals, Electronics, Utilities and Engineering.

Since one of the aims of the survey was to establish contact with the person responsible for environmental issues in each company, the 35% of respondents from environmental management provided good opportunities for making contact with people who could explain and give their judgements on their company. In addition, certain people in general management, production management and quality control showed interest in environmental issues and business activities (Table 5.11).

[12] £1 is equivalent to 1876 Korean Won, *Financial Times*, 15th March 2000.

Table 5.11. Department/Function of Respondents

Department	% (total = 100%)
Environmental management	35
Quality control	18
Production management	15
General management	11
Financial management	10
Marketing/Sales	9
Others	2

5.5.2. Environmental Issues in Business Organisations

Since the majority of responding companies came from the industrial sector, their influence on the natural environment, and their awareness of it, might be expected to be beyond question. However, apart from solid waste and a heavy use of energy, most companies did not consider their activities to have any serious effect on the natural environment. Not only did companies exclude the possibility of acquisition and use of raw materials to have any effect on the environment, but they did not regard the impact on the soil, effluents, air emissions and noise as major influences either. There are several reasons for this seemingly baffling attitude. For instance, some of the companies have only limited or no real production such as electronics products local distributors, whereas environmental problems are mainly considered to be related to production activities. Therefore, managers in those companies may not recognise that their corporate activities have environmental effects.

Although most companies did not acknowledge every environmental impact they might cause, the energy consumption issue was widely accepted by many (51% of respondents agreed). Also, waste (28.2%) issue was relatively accepted by many companies.

Few companies considered that there were any impacts on the environment from raw material extraction, suppliers' production process, logistics or distribution processes, or recycling. For example, 89.4% of respondents regarded raw material extraction as causing small or very small environmental impacts. Interestingly, 70.2% of respondents did not express any view regarding their products' disposal. This may have been because they might not want to discuss their own products' disposal. In addition, 28.8% of respondents believed that their products had great environmental impact, while 69.5% of respondents believed that their products had little environmental impacts. Further detailed research would be required to understand why majorities of respondents believe their products have little environmental impact.

Overall, most respondents showed a negative attitude towards any mention of environmental issues and their business activities. Since environmental issues can be quite sensitive when related to business activities, many respondents may not have wanted to give their opinion. This may cause some difficulty in obtaining reliable evidence from the sample. Therefore, in the main study to be regarded on here a case based approach including face to face interviews was chosen to obtain more reliable, deep data from the targeted sample.

5.5.3. Drivers of Environmental Initiatives

From various sources, 14 different stakeholders were selected as actual drivers of environmental decision making or environmental initiatives. While many drivers of initiatives have been identified, government legislation is generally considered to be the most important (Table 5.12). The survey confirmed that international regulations are perceived as the most influential driver of environmental initiatives (97.1%). The owners of companies (96%), national regulation (95.9%), the press and media (91.7%), customers (90.2%) were also considered significantly important to corporate environmental initiatives or decision making. While complying with legislation was an essential part of environmental initiative, personal conviction and belief also had a strong influence on corporate environmental decision making or initiatives. Therefore, internal and external drivers can be dichotomized. As an internal driver, owners' attitude was identified. As external drivers, legislation, media and customers were confirmed as major drivers of environmental initiatives.

Table 5.12. Major stakeholders that influence corporate green decision making

Stakeholders	%*
Government	97.1
Owners	96.2
Press/Media	91.7
Customers	90.2
Employees	11.1
Suppliers	9.7
Consumer organisations	9.5
Competitors	7.2
Financial Institutions	5.6

* Percentages based on the number of questionnaires showing "strongly agree" in each stakeholder category.

In contrast, financial institutions (5.6%), competitors (7.2%), consumer organisations (9.5%), and suppliers (9.7%) were considered very little important for environmental initiatives or decision-making. In particular, financial institutions did not seem to consider environmental issues in their business policy. This implies that it is not a factor for change in companies' financial and accounting practice. For example, financial institutions may not consider environmental issues such as environmental auditing or data when deciding on loans for industries or companies. In addition, employees, trade unions and academic research institutes seem to be neglected in corporate environmental initiatives.

As Table 5.13 shows, complying with legislation is the top priority (92.2%). More importantly, owners (90.3%) and management attitudes (87.3%) play an important role in leading environmental initiatives. Thus, personal conviction is a crucial factor in considering environmental initiatives. In addition, 88.4% of respondents believe that environmental initiatives improve corporate image. Interestingly, cost saving is still an arguable issue. Thirty-eight percent of respondents believed that environmental initiatives won't save costs while 38% of respondents agreed that environmental initiatives will save costs. Since Porter's hypothesis brought about serious debate among academics, the survey findings reflected ongoing debate of the hypothesis.

Table 5.13. Most common drivers encouraging environmental initiatives in decision-making

	Current drivers (%)	Future drivers (%)
Compliance with environmental regulation	92.2	42.6
Owner's conviction and attitude	90.3	66.8
Management's conviction and attitude	87.3	65.2
Improvement of corporate image	88.4	77.6
Cost savings	38.1	49.3
Strategic positioning	14.4	88.4
New market opportunity	6.8	77.2

Since legislation is considered to be the most important driver, the effect on the company's processes and routines is expected to be directly transferred to the production process, but indirectly it may also influence other business activities such as purchasing, marketing and R&D functions.

When asked to peer five years into the future, there were some major changes. The top three current drivers were regulations, owner's attitude and corporate image. In future, top three drivers are strategic positioning, corporate image and new market opportunity. Furthermore, the pattern of responses was almost identical. The major difference was that market-based factors explained more variation than legislation. This could mean that respondents believed legislation to have reached saturation point and that there will be little or no increasing restrictions in future, whereas competition and other direct market-based factors will influence environmental decisions to a greater extent. In other words, a company's environmental conditions and initiatives can be expected to play a more market-based role in the future. Thus, the survey confirms that market-based business strategy or decision-making is expected to be increasingly applied with respect to environmental initiatives. This will obviously affect most of the company's routines and processes. Since environmental initiatives are becoming popular in Korean industry, one of main research questions is how companies apply those initiatives in practice. Some initiatives have been introduced, but mostly in the internal environment. For example, reduction of air pollution (70.6%) and energy consumption (71.2%), replacement of raw materials (70.6%), reduction and prevention of environmental risks and crisis (68.8%), improving internal working environment (96.7%) were considered significant and applied in their business practice. However, 70.6% of respondents did not consider any initiatives on soil preservation.

According to the survey results, environmental initiatives can be divided two groups on a basis of health and safety, and the environment. One group consists of noise reduction, environmental risks and crisis prevention, and improving the internal working environment. These are issues that are directly relevant to health and safety. In Korean industry, environmental and health and safety schemes were traditionally separated. Today, an integrated health, safety and environment (HS&E) scheme is becoming popular. Therefore, the survey reflects current Korean industrial environmental initiatives which include health and safety schemes.

The other group consists of reduction of solid waste, soil preservation, reduction or replacement of raw material, reduction of water consumption and waste water. These issues have a direct impact on the external environment, and could point to genuine environmental awareness. Since the legal requirements, such as the collection of hazardous waste and treatment of dangerous materials, are considered as an economic burden by many companies, economic concern could play a key role for environmental initiatives through minimising environmental impacts.

More than 90% of respondents in Research and Development, Production, and Marketing departments showed that environmental issues were very seriously considered and reflected in their routine business processes. In contrast, environmental initiatives were not considered very much by purchasing and procurement. Developing new products, production and marketing concerning environmental issues are important for business strategy. But, at the very beginning stage of product design, such as extracting raw materials and purchasing raw materials, environmental initiatives or issues were not considered strategically important.

5.6. Conclusion

This chapter provides background information to the Korean chemical industry. Having reviewed the related literature, the following conclusions can be drawn. First, the industry in general faces environmental pressures and recognises the importance of green issues. As empirical survey results indicate, complying with environmental legislation is the most important current concern, but in the future strategic positioning and corporate image may become top criteria at board level.

Second, the Korean chemical industry realises that environmental legislation at national level is becoming stricter, and that regulations demand more technological investment for pollution reduction. Also, international environmental initiatives including Responsible Care, ISO 14000 and BS 7750 put pressure on the industry to develop new environmentally less harmful products.

Third, the Korean chemical industry has adopted Responsible Care to meet international standards of environment, health and safety (EHS), as well as high quality of products and services. With government support, the industry keeps making progress in reducing environmental pollution, developing environmental auditing system and investing in environmental technology. Therefore, the industry seems to agree that meeting international standards of EHS as well as complying with environmental legislation will have a positive influence in developing new products and markets, and ultimately competitiveness in the future.

Chapter Six

Research Model and Methodology

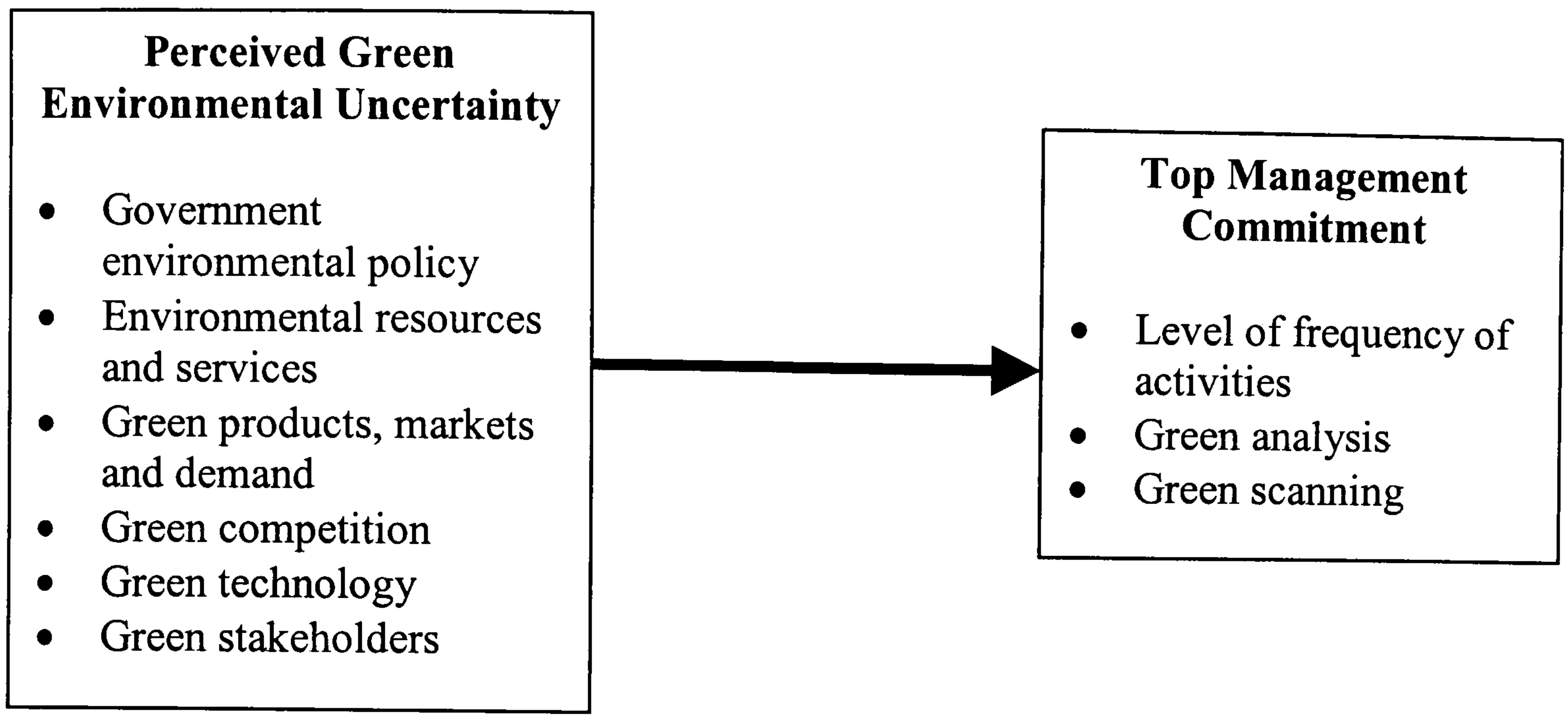
6.1. Introduction

The objective of this chapter is to present the research model, the research methodology and the rationale for employing it in this research. With this objective in mind, the first section of the chapter begins by presenting the research model and propositions. In order to test the model and propositions, it is presented that research tools and ends with the reasons why we have chosen the survey method, the interview and the multi case studies as the research tools to collect primary data for this study. Since the research is about the Korean chemical industry, all the research samples and tools are applied to Korean chemical industry context. The second section, which is considered very important as it relates directly to this thesis, starts by describing how the research tools are developed in the study. Finally, the limitations of the research methods are presented.

As mentioned earlier in chapter 1, the main objective of this research is to understand green issues in strategic decision making at board level. This objective produces research questions as follows: How top executives in the Korean chemical industry perceive uncertainty caused by green issues? Do top executives impact on the effectiveness of implementation of corporate environmental management?

The research objective produces the model as follows (Figure 6.1).

Figure 6.1. The Research Model



In order to test the model above, more detailed propositions are presented. In summary form, the central explanatory proposition addressed in this study is as follows: The extent of corporate greening embodied in any given case of corporate environmental management is a function of the relationship between top management commitment and organisational environment. The validity of this central proposition will be determined by testing the component propositions and examining the interrelationships among them.

Proposition 1a: the greater the perceived green environmental uncertainty caused by government environmental policy, the higher the level of top management commitment.

Proposition 1b: the greater the perceived green environmental uncertainty caused by government environmental policy, the higher the level of frequency in green analysis activities.

Proposition 1c: the greater the perceived green environmental uncertainty caused by government environmental policy, the higher the level of frequency in green scanning activities.

Proposition 2a: the greater the perceived green environmental uncertainty caused by environmental resources and services, the higher the level of top management commitment.

Proposition 2b: the greater the perceived green environmental uncertainty caused by environmental resources and services, the higher the level of frequency in green analysis activities.

Proposition 2c: the greater the perceived green environmental uncertainty caused by environmental resources and services, the higher the level of frequency in green scanning activities.

Proposition 3a: the greater the perceived green environmental uncertainty caused by green products, markets and demand, the higher the level of top management commitment.

Proposition 3b: the greater the perceived green environmental uncertainty caused by green products, markets and demand, the higher the level of frequency in green analysis activities.

Proposition 3c: the greater the perceived green environmental uncertainty caused by green products, markets and demand, the higher the level of frequency in green scanning activities.

Proposition 4a: the greater the perceived green environmental uncertainty caused by green competition, the higher the level of top management commitment.

Proposition 4b: the greater the perceived green environmental uncertainty caused by green competition, the higher the level of frequency in green analysis activities.

Proposition 4c: the greater the perceived green environmental uncertainty caused by green competition, the higher the level of frequency in green scanning activities.

Proposition 5a: the greater the perceived green environmental uncertainty caused by green technology, the higher the level of top management commitment.

Proposition 5b: the greater the perceived green environmental uncertainty caused by green technology, the higher the level of frequency in green analysis activities.

Proposition 5c: the greater the perceived green environmental uncertainty caused by green technology, the higher the level of frequency in green scanning activities.

Proposition 6a: the greater the perceived green environmental uncertainty caused by green stakeholders, the higher the level of top management commitment.

Proposition 6b: the greater the perceived green environmental uncertainty caused by green stakeholders, the higher the level of frequency in green analysis activities.

Proposition 6c: the greater the perceived green environmental uncertainty caused by green stakeholders, the higher the level of green scanning frequency activities.

6.2. Research Methods

The research model and propositions can be explored using quantitative and qualitative data. Quantitative data are a numerical form of data and measurement is an essential part of these data. Measurement is the process by which researchers turn data into numbers (Punch, 1998). Thus, to collect quantitative data is to collect measurements. In order to collect measurements, scaling is used. In the Oxford Concise Dictionary (1998), scaling is defined as "a series of degrees or a graded classification system" (p.1230). Once a scale is chosen (section 6.5.2), it is necessary to construct an instrument or to use an existing instrument. In the research, in order to do this, extensive relevant literatures are reviewed and decide to construct the research instruments. Section 6.5.5 describes this process in detail. The constructed research instrument is then employed to develop a survey questionnaire.

In contrast to quantitative data, qualitative data is non-numerical. Qualitative data covers a wide range of types. According to Denzin and Lincoln (1994), it includes interview transcripts, recordings and notes, observational records, documents and the products and records of material culture, audio-visual materials, and personal experience materials such as diary information. These materials can be used in well-structured interview questions or unstructured, open-ended questions. Well-structured interview questions can provide standardised comparable information but may not allow people to provide information using their own terms, meanings and understandings. Open-ended questions can capture directly the lived experience of people but require some processing to prepare them for analysis such as transcribing and editing.

Quantitative data are necessarily structured in terms of the number systems while qualitative data may range from structured to unstructured. The following section will discuss in more detail the quantitative and qualitative research approaches.

6.2.1. Research Types

Research is defined as "seeking through methodical processes to add to one's own body of knowledge and, hopefully, to that of others, by the discovery of non-trivial facts and insights" (Haward and Sharp, 1983, p.6).

The two distinguishable types of research are quantitative and qualitative. Quantitative research refers in general to the use of statistical methods to produce "hard" data and output. Quantitative research typically uses the questionnaire survey (Bryman, 1988). Bryman (1989) argues that data collection in quantitative methods is based on pre-structured questions. Similarly, Reaves (1992) points that quantitative research involves measuring the quantity of things, usually in numerical quantities. Stroh (2000) also argues that quantitative research is designed to explore a large number of respondent samples in a standardised manner. However, there are some critiques of the application of quantitative research methods. For example, Strogh (2000) says, "the depth of research would have been limited as a result of its inherently standardised approach" (p.197). Similarly, Valentine (1997) points out that, "the tendency of questionnaires surveys to ask a rigid set of simple questions which 'force' or push the respondents' answers into particular categories, which they may not have thought of unprompted or many not want to use, is just one of the reasons why researchers often choose to use interviews either as a supplement or as an alternative to a questionnaire survey" (p.110).

In contrast, qualitative research usually refers non-quantitative research to produce "soft" data and output. The most frequently used form of qualitative research is the interview (Bryman, 1993). Qualitative research typically involves a relatively small number of respondents. According to Patton (1990), qualitative research produces a wealth of detailed information about a smaller number of people and cases and situations studied. Similarly, Birns *et al.* (1990) argue that the strength of qualitative research is to provide the research with a deep understanding of why and how something is happening, also to provide "rich" data by probing into people's attitudes and needs. However, data collection applying qualitative methods faces serious criticism for being anecdotal and difficult to analyse and generalise to other situations (Bryman, 1989; Hakim, 1992; Gill and Johnson, 1997).

6.2.2. Paradigms of Quantitative and Qualitative Research Methods

In social science, a paradigm is a set of assumptions about the social world, and about what constitutes proper techniques and topics for inquiry. Paradigms have been the subject of debate, mainly between quantitative and qualitative research. Quantitative research has been mainly based on positivism. As Tesch (1990) points out, the whole approach of constructing concepts and measuring variables is inherently positivistic. According to Blaikie (1993), the logical positivists in the 1930s and 1940s attempted to develop explanations in the form of universal laws because they believed that objective accounts of the world could be given. Positivists imitate usage of the scientific method in the natural sciences including physics and chemistry. They see the core of the scientific method as the experiment and measurement. An experiment involves comparison between groups and the manipulation of experimental variables in one of them. As mentioned earlier, measurement is the process by which data are turned into numbers by researchers. More importantly, value judgement is concerned. Value judgement is moral judgements or statements. There are two different perspectives which take normative (ought to be) or positive (is) view (Gill and Johnson, 1997). Positivists argue that we cannot use empirical evidence in the making of value judgements because of the gap between fact and value. Positivists argue that there is no logical way to get from statements of fact to statements of value because of a fundamental different between facts and values. Thus, they take the "value-free" conventional scientific view. However, as Lincoln and Guba (1985) suggest, the gap between fact and value is based on a mistaken dualism which sees facts and values as quite different things. They argue that values have a direct impact on research. Thus, they take the "value-laden" view. Interestingly, positivists' "value-free" view may itself be taken as a statement of values, and many see it as discredited in maintaining that inquiry can be value free (Lincoln and Guba, 1985; Haig, 1997; Hammersley, 1995). However, there are no "right" or "wrong", "good" or "bad" paradigms. It is researchers' different positions which they reflect. Thus, it is not productive to argue which paradigm is superior to others or which research methods are better than others. If there are more productive ways to obtain "rich" data for "fruitful" research results, that is the issue to discuss.

In order to overcome the shortcomings and to make use of the benefits of both research methods, Bryman (1988) argues that by combining both research methods, the researcher's claim for validity of conclusions is enhanced. Moreover, qualitative research sometimes facilitates the interpretation of quantitative findings suggested by an investigation.

6.2.3. Triangulation

Denzin (1978) broadly defined triangulation as "the combination of methodologies in the study of the same phenomenon" (p.291). In a similar vein, Cohen and Manion (1989) define triangulation as "the use of two or more methods of data collection in the study of some aspect of human behaviour" (p.269). More recently, Lather (1991) defined triangulation as "critical in establishing data trustworthiness, moving beyond multiple measures, to include counter patterns and divergence" (p.65). Based on different definitions of triangulation above, most authors seem to agree that different quantitative and qualitative research techniques in the same empirical study provide different kinds of complementary data about a "problem". Thus methodological triangulation is considered to overcome the weakness inherent in a single-method approach (Campbell and Fiske, 1959; Denzin, 1978; Jick, 1979). Also, Fielding and Fielding (1986) view triangulation as complementary rather than as competitive. Their view is also found in Jick (1979). He argues that multiple measures may provide some unique variance which may have been neglected by single methods (Jick, 1979).

Perhaps the most prevalent attempts to use triangulation are to integrate fieldwork and survey methods. Many researchers (e.g. Vidich and Shapiro, 1955; Spindler, 1970; Diesing, 1971) argue that quantitative methods can make important contributions to fieldwork, and *vice versa*. Triangulation also may stimulate "the creation of inventive methods, new ways of capturing a problem to balance with conventional data-collection methods (p.608.)." In addition, "the triangulation made possible by multiple data collection methods provides stronger substantiation of constructs" (Eisenhardt, 1989, p.538).

Sarantakos (1998, p.169) well summarises advantages of using triangulation as follows:

- to obtain a variety of information on the same issue
- to use the strengths of each method to overcome the deficiencies of the other
- to achieve a higher degree of validity and reliability
- to overcome the deficiencies of single-method studies

Having reviewed the relevant literature, we decided to use both quantitative and qualitative research methods, triangulation, in this study. This is because the former methods can provide the researcher with a more representative sample, and the latter methods enable him to gain a deep understanding of how respondents perceive and respond to a complex issue like green environmental uncertainty.

6.3. Research Design

Research design is defined as "a collection of guides or rules for data collection" (Adams and Schvaneveldt, 1985, p.103). The main purpose of research design is to provide answers (data) to questions being researched (Adams and Schvaneveldt, 1985).

The common research designs in social science are the exploratory/explanatory and descriptive research designs. As the name implies, exploratory/explanatory research seeks to explain and discover new relationships or looks for hypotheses and as such, it tends to be flexible in its design (Boyd *et al.*, 1989). According to Adams and Schvaneveldt (1985), this type of research is suitable when the researcher wants to (i) satisfy curiosity or seek out new insights, (ii) build a methodology that might be used in later, more tightly designed research, and (iii) make recommendations regarding the likelihood of continuing with additional research on the topic.

Descriptive research, on the other hand, is designed to describe something, for example, the number of viewers who saw a specific television commercial. As such, it is more formal in its structure as it attempts to obtain a complete and accurate picture of a situation (Boyd *et al.*, 1989). According to a number of authors (Quee, 1993; Baker, 1991), descriptive research is suitable when a study intends to produce an accurate description of variables relevant to the decision being faced, without demonstrating that some relationship exists between variables.

In this study, the research design being used is close to the exploratory or explanatory model, though still quite structured in its approach. This type of research design is suitable for this study because, apart from the fact that we want to know how top executives perceive green issues in Korean chemical industry, this type of research design also gives us the opportunity to demonstrate whether a relationship exists between the variables that we are looking at.

In employing this research design, we are presented with two options – the cross-sectional method or the longitudinal method (Davis, 1973; Gill and Johnson, 1997). The cross-sectional method describes an event at one particular point in time, while the latter gives measurements of an event at successive points in time. Naturally, data collected by the longitudinal method are able to provide a greater understanding of a particular problem since they are being measured repeatedly. However, since this method takes a significantly long period of time to complete, it may not be practical for this study due to constraints on time and financial resources.

Past researchers (Lawrence and Lorsch, 1967; Duncan, 1972; Osborn and Hunt, 1974; Miles and Snow, 1978; Hrebiniak and Snow, 1980; Tosi and Slocum, 1984; Miller, 1993) employed cross-sectional studies, a method which allows the researcher access to a larger number of respondents, thus enabling him or her to produce more representative data.

Previous research indicates that obtaining representative structured data is important to answer research questions. Since this study is about the Korean chemical industry, this criterion has an important meaning for meeting the research objectives. In other words, the chemical industry may be represented in the international context, but the industry in a Korean context may have different outcomes which may not be comparable with previous research. Thus, gaining representative data in a structured way can minimise the possibility of producing non-comparable data because of bias or lack of representativeness.

Building on these arguments and the resource constraints that we are facing, cross-sectional methods should be the most effective in achieving the research objectives as spelled out earlier. As such, it will be the method used in this study.

6.4. Approaches to Data Collection

Most researchers seem to agree that the most common approaches to collecting primary data in social science are the survey, observation, case study (Fowler, 1991; Sarantakos, 1998; Yin, 1994). In this study, the survey and case study methods are chosen because they are considered the most appropriate for collecting primary data within a limited time period and limited funds.

The case study aims to understand the case in depth and recognise its complexity and context (Punch, 1998; Yin, 1994)). According to Punch (1998), a case is a phenomenon of some sort occurring in a bounded context. Thus, the case may be a single or small group, even a nation. The main advantages of this method are: first, it can contribute to building an in-depth understanding of the case (Eisenhardt, 1989); second, only an in-depth case study can provide understanding of the important aspects of a new or persistently problematic research area (Yin, 1994). This is particularly true in this study. Discovering the important features of corporate environmental management, developing an understanding of them, and conceptualising them for further study, is best achieved through a case study. Third, the case study can make an important contribution in combination with other research approaches (Diesing, 1971; Yin, 1994). In this study, a survey is followed by case studies.

The main disadvantages, however, are: first, the case study has little generalisability. For example, if there is only a single case, it is not easy to generalise the findings from the study; second, it is costly. Since a case study may involve site visiting, meeting, interviewing people, it is relatively expensive compared with using a questionnaire survey.

Observations in the case method can range from formal to causal data collection activities. The observations are of two types, direct and participant observation. Direct observation involves observations of meetings, sidewalk activities, factory work (Yin, 1994). But, direct observation focuses on a very small sample, is often time-consuming and very selective. Participant observation involves a variety of observers' roles. Participant observation, however, is unable to determine the reasons underlying a certain action or behaviours when the researcher intrudes into the situation during data collection (Webb *et al.*, 1996). Because of the limitations of the observation method, observation is not suitable for this research, as a result, is not considered for this study. To sum up, primary data for this research will be collected through the survey method and the case study method.

6.5. Survey

The most common data collection method in carrying out a survey is the questionnaire. The questionnaire is a method whereby questionnaires are mailed to a sample of the population to be surveyed and the completed questionnaire is returned by mail to the research (Tull and Hawkins, 1990). The main advantages of this method are: (i) it is relatively less costly, it can be accomplished with minimal staff and facilities and it can provide access to widely dispersed samples and samples that are difficult to reach by telephone or in person for other reasons (Fowler, 1991); (ii) this method is appropriate for research where the research design involves structured questions with simple instructions which can be answered easily by respondents (Kinnear and Taylor, 1979).

There are, however, disadvantages of the survey. These are: (i) the researcher has little control over who actually completes the questionnaire as the researcher is not directly involved in data collections (Fowler, 1991); (ii) it is difficult to predict the response rate and there is a substantial risk that an accurate rate cannot be achieved (Kinnear and Taylor, 1979); iii) it can create opportunities for inaccurate results because of confusion (Aaker ad Day, 1986).

Having decided on using a questionnaire survey, next step was to select which sample would be used and decide how big the sample size should be.

6.5.1. Sample

A sample is defined as "a small part or quantity intended to show what the whole is like" (Concise Oxford Dictionary, 1998, p.1220). In social science, a sample refers to a group of people selected from a larger population to be in the study. In order to choose a sample, a researcher employs a sample frame or a list of the sample units from which the researcher draws the sample.

The sample frame in this study is the membership lists of a number of Korean chemical industry associations and confederations. The reason for this was that target organisations should have top management teams, including executives or CEOs, that have been involved in strategic decision making that included green issues. This approach not only considerably improves the chances of accessing suitable organisations but is also more efficient in terms of the resources used and the response rate. In this study, 300 companies from the chemical industry were identified from the sample frame.

There are a number of reasons why the Korean chemical industry is a suitable sample for this study:

- The industry has been the subject of much environmental legislation and regulation covering areas such as air emissions, effluent, wastes and chemicals. A lot of investment in pollution control technology has been made in the last few years. It is also the case that a number of firms have closed as a result, and others continue to struggle or try to form larger groups.

- The industry is reliant on large quantities of petroleum for processing, the availability of which is decreasing and the cost of which is increasing.

- There is a significant amount of waste generation within the industry. Although some of this has been recycled in the past, little effort has so far been made to design out the production of waste. In other words, the transition from end-of-pipe to pollution prevention seems unclear.

6.5.2. Scale of Measurements

The scales of measurement that are used in questionnaires are nominal, ordinal, interval and ratio (Churchill, 1987; Peterson, 1988; Fowler, 1991).

A nominal scale is defined as numbers assigned to events which can be placed into mutually exclusive and exhaustive categories (Sproull, 1995). Nominal scales can be categorical or binary. Categorical scale is which objects sharing certain characteristics are assigned the same identifying symbol and placed in the same category (Peterson, 1988). Binary scale is which respondents can tick as many answers as are applicable to them (Peterson, 1988). Examples of nominal scales are gender, race, marital status. Typical example of answers to questions are male or female.

An ordinal scale is defined as numbers assigned to events which can be placed into mutually exclusive categories and ordered into a greater than or less than scale (Sproull, 1995). Only statements of greater than or less than are permitted in an ordinal scale of measurement (Peterson, 1988). Examples of the ordinal scale are income status, and social class. Typical examples of answers to questions are very high, high, moderate, low and very low.

An interval scale is defined as numbers assigned to events which can be categorised, ordered and assumed to have an equal distance between scale values (Sproull, 1995). Typical example of this scale is attitude scales. Typical examples of answers to questions are scores or Likert scales.

A ratio scale is defined as numbers that rank items such that numerically equal distances on the scale represent equal distances in the property being measured and that the number zero has an absolute empirical meaning (Tull and Hawkins, 1990). Examples of ratio scale are length, weight or distance. Typical example of answers to questions are years, kilograms or kilometres.

6.5.3. Reliability and Cronbach's alpha

Reliability of measurement refers to its internal consistency (Gill and Johnson, 1997). Internal consistency measures estimate how consistently individuals respond to the items within a scale. Cronbach's alpha is the most common form of reliability coefficient (Bordens and Abbott, 1996; Lewis and Lewis, 1996). Alpha measures the extent to which item responses obtained at the same time correlate highly with each other. The alpha coefficient ranges in value from 0 to 1 and may be used to describe the reliability of questionnaires or scales when the response format is not in dichotomous form (Anastasi, 1988; Nitko, 1983). In particular, Cronbach's alpha is often used with attitude instruments which use the Likert scale (Trochim, 1999). Cronbach's alpha also tends to be the most frequently used estimate of internal consistency when there are multiple items and when the numbers of items are relatively bigger (Bordens and Abbott, 1996; Trochim, 1999). The higher the score, the more reliable the generated scale. Nunnally (1978) has indicated 0.7 to be an acceptable reliability coefficient but lower thresholds are sometimes used in academic research (Santos, 1999).

In this study, Cronbach's alpha is employed to check reliability. Since there is no previously developed research instrument to test green environment, it is important to develop a reliable research instrument using Cronbach's alpha.

6.5.4. Questionnaire Design

The survey questionnaire was divided into four sections and consisted of 53 questions, and a blank space at the end of the last section for the respondents to write down any suggestions or comments. Section 1 had seven questions and aimed to find out the respondent's profile. Section 2 was aimed at the strategic response variables and had thirty-three questions under six themes. These are government environmental policy, environmental resources and services, green products, markets and demand, green competition, green technology and green stakeholders. Section 3 had thirteen questions under three themes. These are top management commitment, green analysis and green scanning. All but seven questions required the respondent to circle the appropriate numbers and an open-ended page for any comments or suggestions was also included (see Appendix 6.2 for a copy of the mail questionnaire).

6.5.5. Development of Research Instrument: The Mail Questionnaire Survey

This section describes how the research instruments have been developed and applied in the current research. As Hinkin (1995) points out, researchers may begin using measures or questionnaires before knowing if they are any good or not, and often make significant conclusions only to be conducted by other researchers later on who are able to measure the constructs more accurately and precisely (Hinkin, 1995). In order to develop questionnaire measures bearing in mind Hinkin's (1995) point, the current research takes the following three steps that suggested by Schwab (1980):

Step 1: Item Development (the generation of individual items or questions)

Step 2: Scale Development (the manner in which items are combined to form scales)

Step 3: Scale Evaluation (the examination of the scale in light of reliability and validity issues)

The first step, item development, involves specifying and developing relevant question items or indicators of what the research is setting out to measure. Then, it is necessary to generate items: how many, and where do they come from? Practically speaking, it is important to consider the question of how many items respondents can deal with. Thus, it is worthwhile to develop items for each dimension that respondents can respond to validly. In the second step, scale development combines the set of items to measure the intended construct. That is, each dimension has relevant items or questions under each related dimension. So, combined or collected items construct the scale. In the third step, scale evaluation includes the testing of reliability and validity. A pre-test or pilot study is usually employed for this purpose. During such a pilot study, checking reliability using Cronbach's alpha and testing validity employing correlation of scales can be used.

In step 1 of this study, to define the construct of green environmental uncertainty, is the main goal. In order to develop measurement items (questions), the literature on environmental uncertainty and strategic management was reviewed in depth (e.g., Lawrence and Lorsch, 1967; Duncan, 1972; Child, 1972; Miles and Snow, 1978; Miller, 1993). From the literature, 33 items of green environmental uncertainty and 13 items of strategic decision making have been developed.

In step 2, to develop set of items measuring the intended construct is the main purpose. During this stage, the sample, numbers of items in each domain, scaling of items and sample size are decided. From the research model, six domains of green environmental uncertainty were developed from the Miles and Snow's scale: government, resources and services, product and market, competitors, technology, and stakeholder. Also, there are three themes of strategic decision making: top management' commitment, analysis and green scanning. Cook *et al.* (1981) suggested that minimum number of items per domain should be three. Each domain item ranges from 3 to 10 in the questionnaire.

In step 3, to examine reliability and validity is the main target. Cronbach's alpha for reliability and the correlation of scales with specific sub-scales of the measurement for validity will be applied. Following sections will describe more detail the process from step 1 to step 3.

6.5.5.1. Measurement Scales

Questionnaire items were mainly sourced from earlier studies (Lawrence and Lorsch, 1967; Duncan, 1972; Miles and Snow, 1978; Miller, 1993). Following these earlier studies, the wording of some questions had to be slightly changed to accommodate the research objectives. The questionnaire items are mainly based upon Miles and Snow's (1978) environmental uncertainty measurement scale. Miles and Snow's scale has a total of 25 items with six sub-scales of suppliers, competitors, customers, financial markets, government and regulatory agencies, and unions. The items have 7-point Likert scales to indicate level of predictability (Table 6.1).

Ireland *et al.* (1987) tested reliabilities for the perceived environmental uncertainty scale and its sub-scales developed by Miles and Snow (1978). They found that Cronbach's alpha was 0.69 in suppliers, 0.66 in competitors, 0.60 in customers, 0.75 in financial markets, 0.89 in government and regulatory agencies, and 0.78 in labour unions. In a similar vein, Hitt *et al.* (1982) found the overall reliability of the scale was 0.80. More recently, Buchko (1994) applied Miles and Snow's perceived environmental uncertainty questionnaire in the U.S. automobile industry. He found that overall reliability of the scale exceeded Cronbach's alpha 0.85. The alpha coefficient has strong and positive reliability exceeding 0.70 which Nunnally (1978) suggested as an acceptable level. Therefore, we can be reasonably assured that the environmental uncertainty measurement scales provided by Miles and Snow (1978) can be used as a research tool in this study. However, as Buchko (1994) admitted, it is necessary to develop Miles and Snow's (1978) measurement scales because current organisational environment is much more complicated than Miles and Snow's. In this sense, Miles and Snow's (1978) 25 items are extended within the green environmental uncertainty scale. The newly developed scale is shown in appendix 6.1.

Table 6.1. 25 Items of Miles and Snow's (1978) environmental uncertainty scale

Scales	Items
1. Suppliers of your raw materials and components	1.a. their price change 1.b. quality change 1.c. design change 1.d. introduction of new materials or components
2. Competitors' actions	2.a. their price changes 2.b. product quality changes 2.c. product design changes 2.d. introduction of new products
3. Customers	3.a. demand for existing products 3.b. demand for new products
4. The financial/capital market	4.a. interest rate changes: 4.a.1. short-term debt 4.a.2. long-term debt 4.b. changes in financial instruments available: 4.b.1. short-term debt 4.b.2. long-term debt 4.c. availability of credit: 4.c.1. short-term debt 4.c.2. long-term debt
5. Government regulatory agencies	5.a. changes in laws or agency policies on pricing 5.b. changes in laws or policies on product standards or quality 5.c. changes in laws or policies regarding financial practices 5.d. changes in labour laws or policies 5.e. changes in laws or policies affecting marketing and distribution methods 5.f. changes in laws on policies on acceptable accounting procedures
6. Actions of labour unions	6.a. changes in wages, hours, and working conditions 6.b. changes in union security 6.c. changes in grievance procedures
TOTAL 6 sub scales	TOTAL 25 items

Source: Miles, R. and Snow, C. (1978) Organizational Strategy, Structure, and Process, New York: McGraw-Hill, p.200.

The 7-point Likert scales which were used in Miles and Snow's (1978) work remained because they are the most commonly applied scales to test uncertainty measurement and attitude (Fowler, 1991).

6.5.5.2. Scales of environmental uncertainty and content validity

In business management over last thirty years, the environmental uncertainty of organisations has been receiving increasing attention. For example, Thompson (1967) provides four dimensions of external environment: homogeneous-stable, homogeneous-shifting, heterogeneous-stable and heterogeneous-shifting. Similarly, Lawrence and Lorsch (1967) suggest four different types of external environment: low diversity and non-dynamic, low diversity and highly dynamic, high diversity and non-dynamic, and high diversity and dynamic. Also, Duncan (1972) deals with environmental uncertainty in terms of simplicity and complexity dimensions. More detailed examples of environmental uncertainty and its measurement scales are provided in Table 6.2.

Table 6.2. Selected Examples of Environmental Uncertainty Scales and Measurement

	Duncan (1972)	Osborn and Hunt (1974)	Leifer and Huber (1977)
Scale	Environmental Uncertainty	Environmental Uncertainty	Perceived Environmental Uncertainty
Sample	3 Manufacturing firm (10 units) & 3 Research and Development organisation (12 units)	26 small social service organisations	Health & welfare organisation (12 units)
Number of items in scale	Various (3 items in 12 sub-items and 5 items in 13 sub-items)	27 items	7 items
Scaling Method	5-point Likert scale	9-point Likert scale	5-point Likert Scale

As shown in Table 6.3, Lawrence and Lorsch (1967), Duncan (1972), and Miles and Snow (1978) have been highlighted (Buchko, 1994). However, there have been criticisms of some environmental uncertainty research instruments. As Miller (1993) points out, "a major obstacle to empirical research on perceived environmental uncertainties is the lack of well-established measurement instruments" (p.698). In the early work, in particular, the environmental uncertainty scales of Lawrence and Lorsch (1967) and Duncan (1972) were questioned by Downey *et al.* (1975). According to them, internal reliability appeared to be adequate for research, but they found only a low correlation between the scales and the criteria uncertainty measures. Similarly, Tosi *et al.* (1973) examined Lawrence and Lorsch's (1967) uncertainty scale with 102 executives, and found that the scale was not reliable.

Table 6.3. Some Major Environmental Uncertainty Scales and Measurement

	Lawrence & Lorsch (1967)	Duncan (1972)	Miles & Snow (1978)
Scale	Environmental Uncertainty	Environmental Uncertainty	Perceived Environmental Uncertainty
Number of items In scale	9 items	Variable (3 items in 12 sub-items and 5 items in 13 sub-items)	25 items
Sub-measurement	3 sub-environments (marketing, manufacturing and research)	12 sub-environments and 13 external sub-environments	6 sub-environment of the external environment (suppliers, competitors, customers, financial markets, government and regulatory agencies, unions)
Scaling method	Likert (1-7, using polar statements)	Likert (1=never, 5=always)	Likert (1=predictable, 7=unpredictable)

More recently, Buchko (1994) examined Miles and Snow's (1978) environmental uncertainty scale and found it to have high internal consistency and reliability. However, Buchko suggested that researchers need to explore more items and issues because environmental uncertainty has become turbulent and complicated. Thus, in this research there is a more detailed investigation of components of sub-environment of the external environment. For example, Hrebiniak and Snow (1980) categorise five different areas of external environment which cause environmental uncertainty for decision makers. Similarly, Tosi and Slocum (1984) group four different categories of external environment. More recently, Miller (1993) provides six different category of external environment based on political, government policy and macro economic dimensions (Table 6.4).

Table 6.4. Examples of Components of External Environment

	Duncan (1972)	Miles and Snow (1978)	Hrebiniak and Snow (1980)	Tosi and Slocum (1984)	Miller (1993)
Components of external environment	Customers, suppliers, competitors, socio-political, and technological factors	Suppliers, competitors, customers, financial/capital market, government regulatory agencies, labour unions	Financial/capital markets, government regulation, competitors, suppliers, and general conditions	Customers, capital sources, raw product suppliers, technology and science	Political/government policies, macroeconomic, resources and services used by the company, product market demand, competition, and technology

Recently, Miller (1993) tested six categories and 35 uncertainty indicators. He found that only five categories and 25 uncertainty indicators were acceptable for research purposes. Since at present there are no environmental uncertainty measurement tools with respect to "green" issues in the existing literature, some items from previous measurement mentioned earlier were used to modify Miles and Snow's (1978) perceived environmental uncertainty scale. Based upon Miles and Snow's scale, a total of 33 items of green environmental uncertainty are developed by the author (Table 6.5).

Table 6.5. Development of Green Environmental Uncertainty Scales and Measurement

	Miles & Snow (1978)	**Lee (2001)**
Scale	Perceived Environmental Uncertainty	Perceived Green Environmental Uncertainty
Number of items in scale	25 items	33 items
Sub-measurement	6 sub-environment of the external environment (suppliers, competitors, customers, financial markets, government and regulatory agencies, unions)	6 sub-environment of the external green environment (government, resources and services, product and market, competitors, technology, stakeholder)
Scaling method	Likert (1=predictable, 7=unpredictable)	Likert (1=predictable, 7=unpredictable)

The green uncertainty scale developed by the author addresses organisation's natural environment. In order to test the content validity of the green uncertainty scale, the author conducted a pilot study.

6.5.6. Pilot Study

Before performing the main questionnaire survey, the pilot study was conducted to test the research instrument. Since a pilot study is "concerned with administrative and organisational problems related to the whole study and the respondents" (Sarantakos, 1998, p.293), such a study was designed to achieve the following aims:

- to test the research instrument and its suitability.
- to show whether the sampling frame was adequate.
- to test the response of the subjects to the method of data collection.

A pilot questionnaire was tested with 10 executive MBA students at the Korea Advanced Institute of Science and Industry (KAIST). These executives were from different manufacturing industries. Feedback and comment about questionnaire content were obtained. One executive raised the point that the time to fill in could be longer than expected. The average time to fill in the questionnaire was about 13 minutes. No comments about ambiguity or difficulty of understanding were found.

With regard to the reliability of the research instrument, Cronbach's Alpha was used to assess reliability for the pilot study. As Table 6.6 shows, Cronbach's alpha which indicates the reliability of green uncertainty scales ranges between 0.63 and 0.93. Since the overall alpha exceeds 0.7 which Nunnally (1967) suggested as an acceptable level, the scale shows strong reliability.

Table 6.6. Results of Cronbach's alpha estimator for the Green Uncertainty Perception scales (N=10)

Green Uncertainty Scales and sub-scales	No. of Cases	No. of Items	Alpha
Government Environmental Policy	10	4	0.9179
Environmental resources and services from your organisation	10	5	0.7205
Green products, markets and demand	10	4	0.8271
Green competition	10	6	0.8710
Green technology in your organisation	10	4	0.9331
Green stakeholders in your organisation	10	10	0.6343
Green Uncertainty Scales	**10**	**33**	**0.9456**

Also, as Table 6.7 shows, Cronbach's alpha was used to assess the reliability of the green strategy scales, which consist of green top commitment, green analysis and green scanning. This too found strong reliability exceeding 0.97. Therefore, the pilot study confirmed that the green uncertainty and green strategy constructs were reliable.

Table 6.7. Results of Cronbach's alpha estimator for the Green Strategy scales (N=10)

Strategic Decision Making Scales and sub-scales	No. of Cases	No. of items	Alpha
Green top commitment	10	3	0.9111
Green analysis	10	4	0.9442
Green scanning	10	6	0.9453
Green Strategy Scales	**10**	**13**	**0.9769**

Since there was no sign of confusion or ambiguity in the questionnaires from respondents, and the pilot study indicates the research instrument has strong reliability, no changes were made to the questionnaire survey.

6.5.7. The Survey

The self-administered questionnaire was sent to top management in the chemical industry who were responsible for and/or had an input to strategy formulation and strategic decision making. Beforehand, all potential respondents were called personally by telephone, the background and nature of the project was explained to them and their agreement to participate was obtained. The questionnaire was then sent to the respondent with a personalised letter outlining the agreement to participate. Pre-paid, self-addressed envelops were sent out with the questionnaire for use in return postage. If no questionnaire was returned after approximately 3 weeks then a reminder telephone call was made and, if necessary, a replacement questionnaire sent to the respondent. The information in the questionnaire was agreed to be treated in confidence.

The questionnaires were sent out and returned between March 2000 and May 2000. All late returned questionnaires were excluded from statistical analysis. According to findings from the pilot study, the questionnaire took on average 13 minutes to fill out, which seemed adequate for large samples of the current research. Because time length to fill in the questionnaire can cause less response ratio, a significant effort was made to secure the commitment of top management and the return of the questionnaires.

Table 6.8 Questionnaire response rate statistics

Items	N	% of cases
Questionnaire sent out	300	100.0
Questionnaire returned	143	47.7
Questionnaire filled out partly[a]	40	13.3
Questionnaire filled out completely	103	34.3

[a] Partly filled questionnaire was excluded because not suitable for statistical analysis

The final number of respondents (N=103) was used for statistical analysis. The responding organisations by number of employees and turnover is given in Table 6.9 and Table 6.10.

Table 6.9. Respondents by number of employees (N=103)

Number of employees	N	% of cases
250-2,499	23	22.3
2,500-9,999	16	15.5
10,000-49,999	43	41.8
More than 50,000	21	20.4
Missing cases	0	0.0
TOTAL	103	100.0

Table 6.10. Respondents by turnover (N=103)

Turnover ($m)	N	% of cases
6m-100m	16	15.5
101m-250m	4	3.9
251m-1,000m	11	10.7
More than 1,000m	72	69.9
Missing cases	0	0.0
TOTAL	103	100.0

6.5.7.1. Construct Reliability of Green Environmental Uncertainty

The scales used in this research were tested for reliability using Cronbach's alpha. Table 6.11 shows the results of alpha statistics for the green environmental uncertainty scales.

Table 6.11. Results of Cronbach's alpha estimator of reliability for the Green Perception scales (N=103)

Green Uncertainty Scales and sub-scales	No. Of cases	No. Of Items	Alpha
Government Environmental Policy	103	4	0.7297
Environmental resources and services from your organisation	103	5	0.4697
Green products, markets and demand	103	4	0.8526
Green competition	103	6	0.7950
Green technology in your organisation	103	4	0.6892
Green stakeholders in your organisation	103	10	0.2242
Green Uncertain Scales	**103**	**33**	**0.6620**

The alpha values of all sub-scales but two lie in the range 0.6892 to 0.8526. The two exceptions are: 1) the environmental resources and services' sub-scale which has a value of 0.4697 2) green stakeholders' sub-scale which has a value of 0.2242. Although there are two exceptions, green perception scales possess overall good reliability (alpha=0.6620) (more detailed item-total statistics are provided in Appendix 6.7).

6.5.7.2. Construct Reliability of Green Strategy

As shown in Table 6.12, reliability of green strategy construct is very high. The alpha values of all sub-scales lie in the range 0.8254 to 0.8778. As all alpha values exceed 0.7 that Nunnally (1967) recommended as acceptable value, these findings present strong evidence that the Green Strategy scale possesses very good reliability (more detailed item-total statistics are provided in Appendix 6.7).

Table 6.12. Results of Cronbach's alpha estimator of reliability for the Green Strategy scales (N=103)

Strategic Decision Making Scales and Sub-scales	No. Of Cases	No. Of Items	Alpha
Green top commitment	103	3	0.8494
Green analysis	103	4	0.8778
Green scanning	103	6	0.8254
Green Strategy	**103**	**13**	**0.9438**

6.5.8. Methods of Data Analysis

The main purpose of data analysis is to produce meaning from the primary data that were collected. The author used the Statistical Package for Social Sciences (SPSS®) which is available through the University network. The SPSS® used for this analysis is Window version 9.0. In the data analysis, frequency analysis and Pearson correlation coefficient analysis were used as the most appropriate methods given the type of data in the study. The SPSS® Reliability Analysis programme was used to obtain Cronbach's alpha for reliability testing. Using the reliability analysis, descriptive information about each item and its contribution to the scale was obtained (Appendix 6.6 shows all detailed alpha values on each item).

6.6. Case Study

Within business management study, the case study is one of the most frequently applied research tools (Burton, 2000a). According to Yin (1994), case study is defined as: "An empirical enquiry that investigates a contemporary phenomenon in context; when the boundaries between the phenomenon and the context are not clearly evident, multiple sources of evidence are used" (p.13).

Yin (1994) also claims that case studies are the preferred strategy when "how" or "why" question are being posed, on a contemporary phenomenon within some real life context. (p.1)" Although there are frequently cited critiques against the case study method, e.g. the issue of representativeness, which raises the question of the extent to which the research findings can be generalised to a wider population, the case study is a very flexible method of conducting management or social science research (Burton, 2000a; Hakim, 1992; Yin, 1994).

In order to gain some level of representativeness in the current research, 15 multi case studies which had certain cluster characteristics representative of other cases were conducted (Miles and Huberman, 1994).

Multi case studies in the research are used because of two main reasons:

- to gain more information about the complexity of the research object
- to illustrate, explain, offer more detail and expand quantitative findings

6.6.1. The Interview

One of the most important information sources in the case study is the interview. The interview is a method by which an interviewer asks questions to one or more respondents face-to-face. Denzin and Lincoln (1994) define the interview as "a conversation, the art of asking questions and listening" (p.353). Punch (1998) points out that "the interview is considered a very good way of accessing people's perceptions, meanings, definitions of the situation and construction of reality. It is also one of the most powerful ways we have of understanding others" (p.175).

Since the face-to-face interview gives high flexibility, it allows the researcher to ask more specific questions and to seek more detailed answers. Also, the interview allows the opportunity of mutual communication between the interviewer and the interviewee, so questions can be repeated when responses indicate that interviewees have misunderstood certain questions.

However, there are obvious disadvantages to using the interview in a case study. First of all, it is time consuming and costly (Sarantakos, 1998). Second, there can be poor recall which may cause inaccuracy (Yin, 1994). Tape-recording or immediate note taking during the interview may help in recall. Finally, the method may cause the interviewee to produce biased responses because he or she may wish to defend their organisation or project a good image of it (Kinnear and Taylor, 1979; Yin, 1994).

In this study, the five key topic areas in the simplified version of the interview schedule are as follows (Appendix 6.5. shows the full version of the interview schedule):

- the background of respondents (name, organisation, position)

- the respondents' awareness and knowledge of green issues with their opinion on environmental issues
- problems or risks respondents face integrating environmental issues in strategic decision making
- the reasons why respondents take environmental issues into account in business strategy
- the respondents' perception of the relationship between environmental issues and strategic decision making

Interviews were conducted in 15 companies with a total of 61 corporate executives during the period March through May 2000. The composition of these respondents by job title appears in Table 6.13.

Table 6.13. Composition of Respondents by Position Title

Position	Number
Corporate Executive Officers	15
Corporate Vice Presidents	6
Directors of Environmental Affairs	17
Directors of Environment and Safety	13
Directors of Manufacturing	4
Directors of Marketing	6
TOTAL	**61**

The partially structured, focused interview technique was employed throughout. The interview guide provided the framework of topics to be covered, but the manner and sequence in which they were asked varied from interview to interview. All interviews were conducted with one executive alone. The interviews averaged approximately one and a half hours in duration. All interviews were conducted in Korean. All interviews were tape-recorded and backed up by immediate hand-written notes.

6.6.2. Managing the Interviews

After arrangements had been made, i.e. the appointment date and the interviewees (in this case – 61 executives), managing the interview was the next task. At the beginning of the interview, there was a brief introduction between the author and the interviewee. Then the author outlined the nature of the research interview, reasons why it was being conducted, and the reason why respondents had been selected. This is particularly important because very often people are curious to know why they, in particular, have been selected for interview (Chisnall, 1997). Also, the author assured the interviewees that their personal details would remain confidential in the analysis.

During the interview a checklist was used, which encouraged a fairly loosely-based discussion approach, to encourage the interviewees to explain in some detail certain issues that were raised, as very often such explanations were unobtainable from the main survey questionnaire. Also, by using this approach, we could meet the time limit allowed for the interview, ranging between sixty minutes and ninety minutes.

In closing the interview, gratitude was expressed to the interviewee for their participation, time, and the information they had provided. Besides, the author asked if further visiting or interviewing would be possible, and most participants were willing to give more time through telephone or visiting in the future. Also, as some participants were interested in seeing the final outcome of the research, the author sent them a summary of the findings from the research later on.

Finally, all the interviews were backed up by tape-recording and immediate notes. The permission to tape-record was sought prior to the interview; all participants agreed to be tape-recorded. With regard to language used in the interview, Korean was spoken which was later translated into English for analysis.

6.6.3. Use of Documentary and Secondary Materials

Considerable use was made of documentary and secondary materials. The reason for employing documentation in the case study was that documentary and secondary materials can provide specific details to corroborate information from other sources. In addition, documentation can assist in verifying data from the interview.

Requests were made wherever possible to examine records and documents bearing on the specific issues of environmental management in question. Environmental policy statements, descriptive interim reports, organisation charts and position descriptions of staff were gathered. In addition, some confidential data from the Ministry of Environment, and Environmental Protection Agency (EPA) were collected. This documentary material was useful in supplementing and/or confirming the data gathered in the interviews.

Annual financial and environmental reports, press releases from the firms are secondary materials that often contained relevant information on their environmental and investment activity. Published reports in the business, environmental and legal press in Korea are also valuable sources of data regarding environmental records, expenditures, conflicts with local stakeholder groups and environmental lawsuits.

6.6.4. Categorisation and Scoring of Data from Case Studies

Explicit category sets were constructed for all of the indicators in the study. These sets were inferred from the data on the basis of a clear conception of the range and distribution of the attribute among all the firms, combined with logically sound criteria for making division points. The content of each category was specified as accurately as possible through the use of descriptive 11 indicators (Table 6.14). By using these sets, each with three explicitly defined categories, the data for each firm were assigned to their appropriate grouping. A scoring system was assigned to the categories of each indicator that ranged between 0 and 1 in order to facilitate statistical analysis. The advantages of doing so are: i) more knowledge about the character of the data is retained and ii) greater versatility in statistical manipulation is made possible. Despite these advantages, it is important to recognise the judgements which had to be made in order to convert the mass of raw and heterogeneous qualitative data into homogeneous quantitative indicators. It is hoped, however, that the methods and criteria have been explicated sufficiently such that an independent replication would produce similar results.

Table 6.14. Descriptive 11 Environmental Evaluation Indicators

Evaluation Indicator Scale
1. Top management responsibility
2. Environmental policy
3. Stakeholder involvement
4. Strategic planning
5. Environmental performance
6. Environmental report
7. Environmental management system
8. Environmental standard
9. Record of fine & penalty
10. Environmental liability
11. Eco-product

6.6.5. Clustering Method

The clustering method was employed to determine similarities among the 15 case companies in terms of their profiles on the dimensions of corporate greening. According to Miles and Huberman (1994), events, sites, actors and processes that have similar patterns or characteristics must be sorted into categories and grouped together. This allows the researcher to discuss what happens in the research unit with more confidence, and to "move to higher levels of abstraction". Eisenhardt (1989) also suggests three tactics to make good cross-case comparison. One of them is same as Miles and Huberman (1994) suggested. Another is to select categories or dimensions, then to look for group similarities. She further suggests that "the search for similarity in a seemingly different pair also leads to more sophisticated understanding" (p.541). In addition, she suggests to group cases into three or four for comparison is recommendable. Thus, the 15 case studies were analysed with bearing in mind these tactics of analysis. Cluster analysis provides group categories with graphical output. In particular, Ward's (1963) clustering method is most likely to yield clusters of similar sizes. Barney and Hoskisson (1990) supported that Ward's (1963) clustering method is appropriate for strategic group research. This analysis helps to identify similar groups and offer opportunities to investigate similarities and differences among different cases and groups.

6.6.6. Using the computer-based programme NUD*IST

For the case study, a total of 61 executives in 15 companies were interviewed. This figure represents a relatively large sample for case study research. Since it would be too time-consuming and costly to analyse these data manually, computer software, NUD*IST Window version 4.0, was used. NUD*IST, which stands for Non-numerical Unstructured

Data: Indexing, Searching and Theorizing, is the foremost computer programme for non-numerical data.

The use of computer-based programmes such as NUD*IST in qualitative analysis is dependent upon procedures for coding the text of interview transcripts. As Coffey *et al.* (1996) point out, there are two purposes to the computer-based approach. First, it facilitates the attachment of codes to strips of data. Second, it allows the researcher to retrieve all instances in the data that share a code. In practice, the computer provides many advantages. The speed and comprehensiveness of searches is a major benefit (Burton, 2000b; Tesch, 1990).

In the present research, the programme provided two main functions – managing documents, and creating and managing categories. The function of managing documents includes import document files and change, edit, insert and annotate text. NUD*IST creates an index system in which the user can create, manage and explore ideas and categories. The index system allows the user to store references to documents, and explore and code documents which are imported or external. In addition, NUD*IST provides a text search function. That is, the programme can search the document's text for occurrences of words or strings of characters and restrict the search to a particular text or particular documents. These functions provide a very efficient way of editing and managing qualitative data.

6.7. Limitations on the Research Methods

Despite the best efforts of the researcher, this study was constrained by a number of difficulties and shortcomings which included time and resources available, possible respondent bias and methodological triangulation.

6.7.1. Time

The fieldwork was conducted in Korea, but contacting executives and arranging meetings had to be done in the UK prior to the fieldwork. Even during the stay in Korea, travelling was another difficulty. For example, after having an interview with one executive in Seoul in the morning, on the same day the author had to drive to TaeJeon, in the Central part of South Korea, for three hours for another interview.

6.7.2. Research Funding

This was one of the major limitations which affected the sample size. As the field research required extensive travelling to reach interviewees, lack of funding posed a considerable problem. Major financial support came from the family budget and most expenses were provided by family funding. Thus, the research attempted to minimise the influence from the financial limits on this study.

6.7.3. Respondent Bias

The problems inherent in achieving satisfactory outputs from the case study on the potentially sensitive issue of environmental strategies necessitated purposive and convenience sampling. The absence of previously established and tested operational definitions for most of the constructs employed demanded a great deal of deductive judgement in the creation of working indicators of the concepts. Thus, the categorisation and scoring of the data relies on subjective judgement.

6.7.4. Methodological Triangulation

Although this study benefited from using multi-methods, adopting triangulation is time-consuming and costly. It may prevent more effective use of triangulation and even more fruitful research output. Another limitation is replication. In positivist scientific research, replication is usually considered to be a necessary part of research. But replicating different methods in practice is very hard to achieve. In particular, qualitative methods are problematic to replicate. In further research, others may find difficulties in replicating methodological triangulation because fieldwork conducted in Korea may not be comparable with different countries.

Despite the above limitations, the research findings will contribute to the body of knowledge, in particular, in corporate environmental management and in the field of strategic management in Korea, and will shed new light on the direction of future research in this particular area.

6.8. Conclusion

In this chapter we have described the research model, and research methods adopted for this study, which were questionnaire survey and case study based upon personal interview. We have also discussed a number of related issues, such as the sample, scale of measurements, the pilot study, the development of the research instrument, and the survey. In addition, we have presented the reasons and for choosing companies from the chemical sector as a sample. Looking at what we have discussed in this chapter, it can be said that the choice of the research methods and other procedures were made for their appropriateness and effectiveness in meeting the objectives of the study, as spelled out earlier.

Chapter Seven

Analysis and Findings of the Survey

7.1. Introduction

The objective of this chapter is to present the survey findings. As outlined earlier in chapter 6, the general purpose of the survey would be: "how do executives perceive green environmental uncertainty, and how is perceived uncertainty related to strategic management issues?" To be able to meet this objective, frequency analysis and the Pearson correlation coefficient are employed.

As mentioned in Chapter 6, data for this study were collected using a mail questionnaire survey. The questionnaires were posted to 300 chemical companies operating in Korea. The covering letter accompanying the questionnaire and a stamped return envelope was addressed to the executives of each company. The survey consisted of two parts. The first part of the survey asked respondents to indicate the level of unpredictability which they face in green environmental issues. The second part of the survey asked respondents to indicate the frequency of strategic actions in top management commitment, analysis activity and scanning. A total of one hundred-three companies took part in the survey, giving a response rate of 34.3%. Although every effort was made to ensure that the maximum number of companies could participate in this research, experience revealed that this was not possible, especially in Korea, where the fieldwork was conducted.

However, the response rate of 34.3% is considered as a satisfactory rate in the questionnaire survey. In order to enhance understanding of the survey data and provide additional evidences, the interview was considered as a part of fieldwork. In the last section of the survey questionnaire, there is one section for allowing to contact respondents for further fieldwork. The findings from the interviews are in Chapter 8. It is worthwhile to note that the survey in this research is performed in Korean chemical industry. Thus, it is important to interpret the results with caution and not to generalise them to other sectors of Korean industries or Western chemical industries.

7.2. Respondents' Profile

This section presents the characteristics of the respondents. The respondents in this study are board members or managers in equivalent positions in chemical companies operating in Korea. These include chairmen, chief executives, directors and senior managers. Many of them have relatively lengthy working experience in the industry, and would give top management's view on green issues which they had experienced in the past or face currently.

7.2.1. The Respondents' Position

In the questionnaire, the respondents were asked to state their position, and Table 7.1 shows the breakdown of respondents by position. The results indicate that a relatively large percentage of respondents in this survey are chief executives 38.8%, while the respondents who are senior managers are 24.3%; directors 24.3%; chairman 9.7% and others 2.9%.

Table 7.1. Respondents' Position

Position	No.	%
Chairman	10	9.7
Chief Executive	40	38.8
Director	25	24.3
Senior Manager	25	24.3
Others	3	2.9
Total	103	100.0

The three largest groups in our survey, i.e. chief executives, directors and senior managers, indicate that they deal with green issues at board meetings or at least had similar experience. Since these three groups can be considered as the basis of the top management team, their answers to the questionnaire would provide insights of top management's view on green issues in the chemical industry in Korea.

7.2.2. The Respondents' Ages

The respondents were asked to state their age. As seen in Table 7.2, the majority of the respondents 71.8% in this research are from an older group between the age of 46-55 which reflects the seniority of our respondents. 12.6% of the respondents are within the 41-45 years old range while only 14.6% are above 55 years old. Only 1.0% of the respondents are younger than 40.

Table 7.2. Respondents by Age Group

Age Group	No.	%
Below 40 years	1	1.0
41-45 years	13	12.6
46-50 years	27	26.2
51-55 years	47	45.6
Above 55 years	15	14.6
Total	103	100.0

7.2.3. The Respondents' Working Years in the Company

The respondents were asked to state the number of years they had worked in their company. As seen in Table 7.3, the majority of the respondents in this study have relatively lengthy working experience. The 17.5% of respondents have less than 10 years working in their company while 1% of the respondents have worked in their company more than 25 years.

Table 7.3. Respondents by Working Years

Working Years	No.	%
Less than 10 years	18	17.5
11-15 years	28	27.2
16-20 years	25	24.2
21-25 years	31	30.1
More than 25 years	1	1.0
Total	103	100.0

To sum up, the respondents' profile give background information of respondents, in particular, top management characteristics in terms of positions, ages and working years. Following sections will discuss more detail about green environmental uncertainty and strategic relevance.

7.3. Green Environmental Uncertainty

As discussed earlier in chapter 3, organisational responses to green issues are dependent upon executives' perceived green uncertainty. In this study, green environmental uncertainty on page 52 in chapter 3 has already been defined as a decision maker's perceived inability to predict accurately what the green attributes related outcomes of a decision might be. Identifying factors, which influence those executives' decision in relation to green issues and the relationship between those factors and executives activities related to green issues, is the main purpose of the survey. This section presents the findings from the survey of green environmental uncertainty. In this section, the respondents were asked to indicate the level of predictability in six different domains: government environmental policy (GEP), environmental resources and services (ERS), green products, markets and demand (GPMD), green competition (GC), green technology (GT) and green stakeholders (GS). The frequency table is, in general, used to test the level of predictability in green environmental uncertainty. The respondents were also asked to indicate their attitude to strategic management issues: green top management commitment (SED 1-3), green analysis (SED 4-7) and green scanning (SED 8-13). In this research, it is expected that executives' green environmental uncertainty has influence on green attributed activities in strategic management. In order to test the relationship between green environmental uncertainty and strategic management, the Pearson correlation coefficient is employed with the significance at the 0.01 level ($p < .01$). Since the range of the coefficient is between –1 and +1, the significance of the correlation is considered as follows (Fowler, 1991):

- very low – if the coefficient has a value under 0.20.
- low – if the coefficient has a value between 0.21 and 0.40.
- moderate - if the coefficient has a value between 0.41 and 0.70.
- high - if the coefficient has a value between 0.71 and 0.91.
- very high – if the coefficient is over 0.91.

This list offers a guide to interpret a coefficient value.

7.3.1. Government Environmental Policy

It is observed that government environmental regulations and policies are becoming stricter than before during the 1990s. Also, chemical industry in Korea responded to those regulations and policies by voluntary programme such as the *Responsible Care.* The responses show that there was high predictability in government environmental policy. For example, more than 85% of respondents agree that policy in environmental pricing (GEP1), environmental tax (GEP2), environmental regulations (GEP3) and enforcement of existing environmental laws (GEP4) are highly predictable. Hence, there is very low green environmental uncertainty in government environmental policy (Table 7.4). Not surprisingly, respondents pay much attention to government environmental policy, as a result, the level of predictability on the policy is high.

Table 7.4. Frequency Table in Unpredictability in Government Environmental Policy (%)

N=103

Unpredictability	GEP1	GEP2	GEP3	GEP4
1	30.2	29.4	36.4	44.4
2	58.4	56.2	48.2	41.7
3	5.1	6.8	7.8	3.5
4	2.2	3.6	4.2	4.1
5	2.1	3.5	3.1	2.3
6	1.7	0.3	0.2	2.1
7	0.3	0.2	0.1	1.9
TOTAL	100.0	100.0	100.0	100.0

All variables were measured on a seven-point Likert scale.

Then, the correlation between unpredictability in government environmental policy and the level in top management commitment was tested. There are three items of top management commitment: corporate vision (SED1), executives' announcement of vision on green issues (SED2), environmental commitment and progress (SED3). As shown in Table 7.5, the coefficients indicate that GEP1 has a moderate positive association with green top management commitment. GEP2 has also a moderate level while GEP3 has a low level. Also, GEP4 has moderate correlation with the issues in top management commitment. In particular, uncertainty in environmental pricing policy is very positively associated with the level top management's green commitment. It may imply that pricing sensitivity is one of the major factors behind top management's commitment to environmental strategy or relevant strategic decision making. The government environmental policy in general has low uncertainty (i.e. high predictability), and the correlation matrix shows that there is a not strong but significant positive relationship between unpredictability in government environmental policy and frequency in top managers' commitment. The correlation results are all positive in the range of 0.302 to 0.548 which are all significant at $p < .01$. The results, therefore, support the proposition that the greater the perceived green environmental uncertainty caused by government environmental policy, the higher the level of frequency in top management commitment activities.

Table 7.5. Correlation between Unpredictability in Government Environmental Policy and Frequency in Top Management's Green Commitment

	GEP1	GEP2	GEP3	GEP4	SED1	SED2	SED3
GEP1	1.000	.409**	.310**	.335**	.400**	.480**	.548**
GEP2		1.000	.359**	.435**	.492**	.367**	.475**
GEP3			1.000	.572**	.366**	.200*	.332**
GEP4				1.000	.485**	.302**	.467**
SED1					1.000	.562**	.636**
SED2						1.000	.757**
SED3							1.000

** Correlation is significant at the 0.01 level (2-tailed).

Then the relationship between unpredictability in government environmental policy and frequency of carrying out green analysis is presented in Table 7.6. Green analysis includes: the application of evaluation tool such as life cycle assessment or environmental impact assessment (SED4), the formal search and evaluation of environmental opportunities (SED5), the use of environmental specialists to prepare interim reports (SED6), the use of outside environmental specialists or consultants on strategic decisions (SED7). There is, in general, a not strong but significant positive relationship between perceived uncertainty in government environmental policy and frequency in green analysis. The correlation results are all positive in the range of 0.327 to 0.585 which are all significant at $p < .01$. The results, therefore, support the proposition that the greater the perceived green environmental uncertainty caused by government environmental policy, the higher the level of frequency in carrying out green analysis activities.

In particular, unpredictability in enforcement of existing environmental laws has a very positive association with green analysis tools and staff. This implies that the level of unpredictability in existing environmental laws has influenced top managers to pay attention to environmental strategies or relevant analytic tools and techniques. For example, top management spent more time and resources on analysis activities such as developing environmental evaluation tools, employing outside consultants for interim reports when they perceived greater green environmental uncertainty.

Table 7.6. Correlation between Unpredictability in Government Environmental Policy and Frequency of carrying out Green Analysis

	GEP1	GEP2	GEP3	GEP4	SED4	SED5	SED6	SED7
GEP1	1.000	.409**	.310**	.335**	.400**	.585**	.438**	.437**
GEP2		1.000	.359**	.435**	.432**	.424**	.492**	.327**
GEP3			1.000	.572**	.360**	.269**	.503**	.331**
GEP4				1.000	.511**	.409**	.547**	.530**
SED4					1.000	.713**	.612**	.601**
SED5						1.000	.633**	.621**
SED6							1.000	.688**
SED7								1.000

** Correlation is significant at the 0.01 level (2-tailed).

With regard to green scanning, Table 7.7 shows the relationship between unpredictability in government environmental policy and frequency in carrying out green scanning activities. Green scanning involves environmental scanning in stakeholders, monitoring environmental issues and relevant legislation. The questionnaire items in green scanning include: dialogue with environmental stakeholders (SED8), monitoring of environmental issues (SED9), monitoring environmental legislation (SED10), annual environmental report (SED11), annual social report (SED12) and the third party involvement in monitoring and auditing (SED13). As shown in Table 7.7, there is, in general, a moderate level of positive association between unpredictability in governmental policies and frequency in green scanning activities except in the case of SED13. For example, unpredictability in environmental pricing policies (GEP1) and tax policies (GEP2) have a non-significant positive association with third party monitoring and auditing (SED13). It implies that top managers consider third party monitoring and auditing is not relevant to government tax or pricing policies. Since top managers collect and interpret relevant information through green scanning, third party involvement in corporate environmental strategy may not be a serious matter in part for top managers because there is no significant relationship between unpredictability in environmental pricing and tax policies and third party monitoring and auditing. Similarly, unpredictability in environmental regulation (GEP3) and enforcement of existing environmental laws (GEP4) have no significant positive relationship with annual social report (SED12). It seems that the term social report is relatively new to many executives. At present, producing an environmental report is a voluntary activity in Korea, so it is not surprising executives view social report is not associated with predicting environmental regulation or laws. They consider producing environmental or social report is an additional work rather than an essential part of their scanning activities. Even the significant negative relationship between social report (SED12) and level of third party involvement (SED13) implies that executives are not aware of the issue of social report or the published social report can be subjective work without outside auditing involvement.

So when government environmental policy is less predictable by executives, there is a positive relationship between unpredictability in government environmental policy and frequency of green scanning. The correlation results are all positive in the range of 0.097 to 0.419 which six out of twenty four are non-significant ($p < .01$). The results, therefore, generally support the proposition that the greater the perceived green environmental uncertainty caused by government environmental policy, the higher the level of frequency in green scanning.

For example, when there is green uncertainty in future environmental legislation for plastic packaging, executives pay more attention to information gained through scanning activities. Spending time and resources for seeking information through green scanning may reduce the level of green uncertainty which executives perceive.

Table 7.7. Correlation between Unpredictability in Government Environmental Policy and Frequency of carrying out Green Scanning

	GEP1	GEP2	GEP3	GEP4	SED8	SED9	SED10	SED11	SED12	SED13
GEP1	1.000	.409**	310**	335**	285**	.426**	352**	517**	214**	.134
GEP2		1.000	359**	.435**	385**	284**	.419**	503**	251*	.135
GEP3			1.000	.572**	.198*	305**	289**	302**	.128	276**
GEP4				1.000	333**	.447**	.401**	313**	.097	.478**
SED8					1.000	.783**	.768**	.512**	.008	.630**
SED9						1.000	.791**	.569**	.057	.616**
SED10							1.000	.633**	.052	.687**
SED11								1.000	.472**	328**
SED12									1.000	-240*
SED13										1.000

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Before examining, other green environmental uncertainty domains, it is worth while to discussing further findings from strategic management issues separately. As Table 7.8 shows, the frequency level of commitment to strategic management issues in this area is generally low.

Table 7.8 Means and Standard Deviations of Frequency level of commitment in Strategic Management Issues

Variable	Mean	Standard Deviation
SED1	2.2330	1.2540
SED2	2.4660	1.3047
SED3	2.4272	1.3255
SED4	2.4854	1.2975
SED5	2.6408	1.3566
SED6	2.3592	1.2591
SED7	2.2330	1.1479
SED8	1.9223	1.2182
SED9	1.8447	1.2815
SED10	1.8738	1.2578
SED11	1.5049	1.3994
SED12	1.6699	1.3090
SED13	1.9515	1.2076

N=103. All variables were measured on a seven-point Likert scale.

With regard to the correlation in strategic management issues, there is very high significant positive association between commitment frequencies except the issue of an annual social reports (SED12) (Table 7.9). For example, there is very significantly positive relationship between SED2 and SED3. That is, the frequent of executives' announcement of vision on green issues has significantly positive impact on environmental commitment and progress. Also, the frequency of the issue of social reports (SED12) has no significant relationship with frequencies in many other strategic management issues. There is even negative relationship between social report (SED12) and the third party's monitoring and auditing (SED13). It implies that respondents are not aware of social report or do not familiar to the term "social report".

Table 7.9. Correlations of Frequency in Strategic Management Issues

	SED1	SED2	SED3	SED4	SED5	SED6	SED7	SED8	SED9	SED10	SED11	SED12	SED13
SED1		562**	.636**	526**	.609**	.698**	.623**	.622**	.651**	.659**	.631**	.191	409**
SED2			.757**	.624**	.688**	589**	.725**	597**	.648**	.652**	.740**	355**	487**
SED3				.733**	.751**	.671**	.739**	.719**	.796**	803**	.728**	223*	558**
SED4					.713**	.612**	.601**	576**	.688**	.663**	.695**	309**	359**
SED5						.633**	.621**	481**	571**	588**	.665**	280**	294**
SED6							.688**	.792**	.661**	.654**	564**	.156	508**
SED7								.742**	.791**	.795**	555**	.137	.673**
SED8									.783**	.768**	512**	.008	.630**
SED9										.791**	569**	.057	.616**
SED10											.633**	.052	.687**
SED11												472**	328**
SED12													-240*
SED13													

N=103. All Variables were measured on a seven-point scale.
*. Correlation is significant at the 0.01 level (2-tailed).
**. Correlation is significant at the0.05 level (2-tailed).

The correlation of frequency in top management commitment as well as in green analysis has a highly significantly association. With the exception of social report (SED12), The correlation of frequency in green scanning also has very positive relationship. Thus, it can be concluded that the greater top management commitment, the higher the level of green analysis frequency. Also, the greater top management commitment, the higher the level of green scanning frequency.

7.3.2. Environmental Resources and Services

Since relevant resources and services are one of the essential parts of corporate environmental management, identifying top managers' perceptions of these area is important for understanding their role in corporate environmental management. Respondents were asked to state the level of predictability availability of environmental resources and services. The questionnaire items on environmental resource and services include: availability of environmental staff (ERS1), environmental impact of inputs (ERS2), environmental impact of outputs (ERS3), availability of disposal services (ERS4) and availability of natural resources (ERS5). As Table 7.8 shows, all items in Environmental Resources and Services (ERS) except availability of natural resources (ERS5) are highly predictable (exceeding 80%). Interestingly, the responses show no significant unpredictability of availability of natural resources (ERS5). That is, about 20% of respondents indicate "I don't know" scale (i.e. respondents indicate level 4 of predictability between 1 and 7, so their indication is on neutral place.) (Table 7.10). It suggests that respondents think future availability of natural resources is uncertain or do not understand environmental issues relating to natural resources.

Table 7.10. Frequency Table of Unpredictability in Environmental Resources and Services (%)

N=103

Unpredictability	ERS1	ERS2	ERS3	ERS4	ERS5
1	43.3	54.5	23.3	30.1	4.9
2	42.1	30.2	32.8	51.4	30.1
3	5.8	5.4	26.1	10.5	34.5
4	1.0	2.2	6.3	4.6	19.4
5	3.2	2.4	5.2	3.2	4.8
6	3.1	3.1	5.1	0.1	4.2
7	1.5	2.2	1.2	0.1	2.1
TOTAL	100.0	100.0	100.0	100.0	100.0

All variables were measured on a seven-point Likert scale.

As shown in Table 7.11, there is a small positive relationship between unpredictability in environmental resources and services (ERS) and frequency in top management's green commitment (with the exception of environmental impact of outputs (ERS3) and availability of natural resources (ERS5)). There is no significant relationship between unpredictability in environmental impact of outputs (ERS3), availability of natural resources (ERS5) and executives' announcement of vision on green issues (SED2). It may mean that environmental impact of outputs is not part of the corporate vision when executives or executive teams announce their vision of environmental concern. In addition, from the relationship between unpredictability in availability of natural resources (ERS5) and executives' announcement of vision on green issues, (SED2) and environmental commitment and progress (SED3), it can be added that unpredictability in the availability of natural resources (ERS5) with regard to green concern is not seriously considered in corporate vision, environmental strategy or core business by top managers. Thus, when it is less predictable in environmental staff, environmental impact of inputs and disposal services by executives, there is significant positive relationship with frequency in top management commitment. This implies that organising environmental staff, measuring environmental impacts of inputs and making contract with local agency for disposal services are reflected in top management commitment. In addition, it seems that top management commitment is partly focused rather than systematically because outputs and natural resources are not related to top management commitment. So, it is possible to conclude that top managers have limited commitment on environmental resources and services without systematic view as a whole. Possibly, limited understanding of the issues or lack of knowledge may influence top managers' commitment on those issues. The correlation results range from –0.147 to 0.494 and six out of fifteen relationships are non-significant ($p < .01$). Thus, it is rejected the proposition that the greater the perceived green environmental uncertainty caused by environmental resources and services, the higher the level frequency in top management commitment activities.

Table 7.11. Correlation between Unpredictability in Environmental Resources and Services and Frequency in Top Management Green Commitment

	ERS1	ERS2	ERS3	ERS4	ERS5	SED1	SED2	SED3
ERS1	1.000	.231*	.156	.086	-.078	.416**	.345**	.494**
ERS2		1.000	.173	.393**	.084	.266**	.309**	.362**
ERS3			1.000	-.004	.252*	.021	-.142	.087
ERS4				1.000	.267**	.266**	.365**	.364**
ERS5					1.000	0.76	-.095	-.147
SED1						1.000	.562**	.636**
SED2							1.000	.757**
SED3								1.000

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Similarly, with two exceptions, ERS3 and ERS5, there is a highly positive association between uncertainty in environmental resources and services (ERS) and carrying out green analysis. For example, uncertainty in trained environmental staff (ERS1), environmental impact of inputs (ERS2) and disposal service availability (ERS4) are in general related to green analysis. However, environmental impacts of outputs (ERS3) has a negative association with the application of evaluation tools such as life cycle assessment or environmental impact assessment (SED4) and the formal search and evaluation of environmental opportunities (SED5). This may mean that SED4 and SED5, the evaluation tools and the search for new business opportunities, investments and markets do not consider environmental impacts of outputs. Interestingly, environmental impact of inputs (ERS2) has a positive relationship with green analysis activities. Thus, during green analysis, environmental impact of inputs (ERS2) only is considered for strategic decision making. In addition, the availability of natural resources (ERS5) has very similar result as an environmental impact of outputs (ERS3) has. That is, the uncertainty of availability of natural resources (ERS5) is not considered during the strategic analysis of green issues (Table 7.12). When it is less predictable in environmental staff, environmental impact of inputs and disposal services by executives, there is significant positive relationship with frequency in green analysis activities.

Overall, the correlation results range from –0.175 to 0.572 and eight out of twenty relationships are non-significant (p< .01). Thus, it is rejected the proposition that the greater the perceived green environmental uncertainty in by environmental resources and services, the higher the level of frequency in green analysis activities.

Table 7.12. Correlation between Unpredictability in Environmental Resources and Services and Frequency of carrying out Green Analysis

	ERS1	ERS2	ERS3	ERS4	ERS5	SED4	SED5	SED6	SED7
ERS1	1.000	.231*	.156	.086	-.078	.485**	.321**	.572**	.375**
ERS2		1.000	.173	.393**	.084	.468**	.330**	.309**	.342**
ERS3			1.000	-.004	.252*	-.022	-.098	.174	.154
ERS4				1.000	.267**	.258**	.403**	.265**	.431**
ERS5					1.000	-.176	-.130	.188	.062
SED4						1.000	.713**	.612**	.601**
SED5							1.000	.633**	.621**
SED6								1.000	.688**
SED7									1.000

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

With the exception of ERS3 and ERS5, the items in environmental resource are positively related with items in green scanning. Unpredictability in environmental personnel (ERS1), environmental impact of inputs (ERS2) and availability of disposal services (ERS4) are positively related to environmental stakeholders (SED8), monitoring of environmental issues (SED9) and legislation (SED10), annual environmental (SED11) and social report (SED12), and the third party's monitoring and auditing (SED13). However, unpredictability in environmental impact of outputs (ERS3) is negatively related to annual environmental (SED11) and social report (SED12). Thus, there is no positive relationship between the publication of annual social and environmental reports and unpredictability in environmental impact of outputs. It may mean that companies do not want to publicise the data of environmental output impacts on social and environmental reports. In addition, a negative association between social report (SED12) and third party's monitoring and auditing (SED13) implies that companies do not reveal environmental performance data publicly.

Similarly, the unpredictability in availability of natural resources (ERS5) is negatively related to monitoring of environmental legislation (SED10), environmental report (SED11) and social report (SED12). So, there is no positive relationship between the availability of natural resources and monitoring environmental legislation, and the publication of social and environmental report (Table 7.13). As found in top management commitment, executives have limited view of green issues with relation to green scanning. Since scanning is a process of information collection, if collected information is not relevant to executives view on certain green issues like the availability of natural resources, then no action will follow for certain green issues. That is, limited executives view has significant impact on green scanning activities. The overall correlation results range from –0.495 to 0.507 and fourteen out of thirty relationships are non-significant ($p < .01$). Thus, it is rejected the proposition that the greater the perceived green environmental uncertainty caused by environmental resources and services, the higher the level of frequency in green scanning activities.

Table 7.13. Correlation between Unpredictability in Environmental Resources Services and Frequency of carrying out Green Scanning

	ERS1	ERS2	ERS3	ERS4	ERS5	SED8	SED9	SED10	SED11	SED12	SED13
ERS1	1.000	231*	.156	.086	-.078	535**	389**	507**	.458**	.195*	366**
ERS2		1.000	.173	393**	.084	367**	399**	306**	454**	.065	.119
ERS3			1.000	-.004	252*	362**	.107	206*	-.070	-.495**	430**
ERS4				1.000	267**	346**	304**	256**	284**	.008	.173
ERS5					1.000	233*	.092	-.132	-.064	-.194*	.090
SED8						1.000	.783**	.768**	512**	.008	.630**
SED9							1.000	.791**	569**	.057	.616**
SED10								1.000	.633**	.052	.687**
SED11									1.000	472**	328**
SED12										1.000	-240*
SED13											1.000

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

7.3.3. Green Products, Markets and Demand

In 1990s, green products such as zero-carbon fuel cell have been introduced in markets. Also, growing consumer demand for environmentally friendly products such as biodegradable detergents in consumer market has been observed. The respondents were asked to state the level of predictability in green products, markets and demand (GPMD). The items in GPMD include customer green preferences (GPMD1), green product demand (GPMD2), availability of substitute green products (GPMD3) and availability of complementary green products (GPMD4).

The pattern of responses shows that there is generally a high level of predictability. For example, customer's green preference (GPMD1) is highly predictable exceeding 80%. Notably, more than 20% of respondents show no clear sign of predictability with regard to green product demand (GPMD2), availability of substitute green products (GPMD3) and complementary green products (GPMD4) (Table 7.14). It may imply that the respondents are aware of green issues in products, markets and demands, but do not clearly understand or they could be aware but are unable to predict green products demand, substitute green products and complementary green products. Awareness without clear understanding of green products demand and products may result in limited strategic decision makings.

Table 7.14. Frequency Table of Unpredictability in Green Products, Markets and Demand (%)

N=103

Unpredictability	GPMD1	GPMD2	GPMD3	GPMD4
1	2.9	10.7	6.8	2.9
2	31.4	21.3	27.2	23.7
3	51.3	33.9	36.8	38.2
4	4.8	29.1	21.3	30.8
5	3.2	2.1	3.2	2.1
6	3.4	1.3	2.4	2.0
7	3.0	1.6	2.3	0.3
TOTAL	100.0	100.0	100.0	100.0

All variables were measured on a seven-point Likert scale.

As Table 7.15 shows, there is no positive association between unpredictability in green products, markets and demand (GPMD) and frequency in green top management commitment except the relationship between customer green preference (GPMD1) and environmental commitment and progress (SED3). Thus, it can be concluded that unpredictability in green products and demand at large are not considered in top management's commitment with regard to corporate environmental strategy. The only positive relationship between unpredictability in customer green preference (GPMD1) and frequency in environmental commitment and progress (SED3) may explain that customer green preferences (GPMD1) only is considered in strategic management by top managers. An interesting finding here is that top managers are concerned about customer's green preference, but they do not commit themselves to green product demand or green products. It implies that top managers are aware of customer's green preferences, but don't take strategic actions yet. Possibly, there is a gap between top managers' awareness and understanding. That is, although top managers are aware of customer's green preferences, maybe they do not understand the issue. The correlation results range from –0.183 to 0.250 and the relationship are non-significant ($p < .01$). Thus, the proposition that the greater the perceived green environmental uncertainty caused by green products, markets and demand, the higher the level of frequency in top management commitment is rejected.

Table 7.15. Correlation between Unpredictability in Green Products, Markets and Demand and Frequency in Top Management Green Commitment

	GPMD1	GPMD2	GPMD3	GPMD4	SED1	SED2	SED3
GPMD1	1.000	.461**	.584**	.483**	.170	-.008	.250*
GPMD2		1.000	.671**	.633**	.014	-.183	-.039
GPMD3			1.000	.733**	.091	-.100	.061
GPMD4				1.000	.029	.020	.157
SED1					1.000	.562**	.636**
SED2						1.000	.757**
SED3							1.000

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

As Table 7.16 shows, there is no significant positive relationship between unpredictability in green products, markets and demand (GPMD) and frequency of carrying out green analysis. The explanation may be that during green analysis the uncertainty in green products, markets and demand (GPMD) are not seriously considered by top managers with respect to corporate environmental strategy. In addition, to decide to use detailed green analytical tools such as life cycle assessment (SED4), the search and evaluation of business opportunities (SED5), internal environmental specialists (SED6) and external outside environmental consultants (SED7) for green products, markets and demand

(GPMD) may be influenced by uncertainty. Not surprisingly, without top management commitment to green products and demand, it is not expected to apply green analytical tools for searching and exploring green markets and demand. Since serious strategic actions with relation to green products and demand are not considered by top managers, detailed efforts are not made for green analysis. The correlation results range from –0.147 to 0.194 and all relationships are non-significant at $p < .01$. The results, therefore, reject the proposition that the greater the perceived green environmental uncertainty caused by green products, markets and demand, the higher the level of frequency in green analysis activities.

Table 7.16. Correlation between Unpredictability in Green Products, Markets and Demand (GPMD) and Frequency of carrying out Green Analysis

	GPMD1	GPMD2	GPMD3	GPMD4	SED4	SED5	SED6	SED7
GPMD1	1.000	.461**	.584**	.483**	.139	.149	.079	.186
GPMD2		1.000	.671**	.633**	-.135	-.147	.038	.121
GPMD3			1.000	.733**	-.098	-.147	.072	.090
GPMD4				1.000	-.015	-.071	.141	.194*
SED4					1.000	.713**	.612**	.601**
SED5						1.000	.633**	.621**
SED6							1.000	.688**
SED7								1.000

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

As Table 7.17 shows, there is a small positive relationship between unpredictability in green products, markets and demand (GPMD) and frequency in green scanning except SED11 and SED12. For example, dialogue with environmental stakeholders (SED8), monitoring environmental issues (SED9) and legislation (SED19) have a positive relationship with green products, markets and demand. However, there is a negative relationship between unpredictability in green products, markets and demand and frequency in environmental report (SED11) and social report (SED12). The uncertainty to the publication of a social and environmental report is negatively related to uncertainty in green products, markets and demand (GPMD) with respect to environmental decision making and strategy. Possibly there are two possible explanations. First, top managers seek more information through social and environmental reports to reduce the level of uncertainty without attempting for incorporation with corporate environmental strategy. Second, top managers are somewhat reluctant to publicise their corporate environmental activities or relevant strategies to many stakeholders using social and environmental reports because they are not convinced to publish social and environmental reports for reducing the level of uncertainty. In addition, uncertainty in green products, markets and demand have moderate positive association with the third party's involvement in monitoring and auditing. It may imply that top managers rely more on the third party's involvement for evaluating green products, markets and demand. An interesting finding here is the relationship between uncertainty in green products, markets and demand and social report (SED12), and the third party involvement in monitoring and auditing (SED13). Although executives want the third party involvement in the issues on green products, markets and demand, they do not want the issues to make any relation to social and environmental reports. The correlation results range from –0.583 to 0.546 and twelve out of twenty four relationships are non-significant at $p< .01$. The results, therefore, reject the proposition that the greater the perceived green environmental uncertainty caused by green products, markets and demand, the higher the level of frequency in green scanning.

Table 7.17. Correlation between Unpredictability in Green Products, Markets and Demand (GPMD) and Frequency of carrying out Green Scanning

	GPMD1	GPMD2	GPMD3	GPMD4	SED8	SED9	SED10	SED11	SED12	SED13
GPMD1	1.000	.461**	.584**	.483**	.214*	.230*	.355**	.147	-.271**	.328**
GPMD2		1.000	.671**	.633**	.223*	.210*	.121	-.108	-.583**	.371**
GPMD3			1.000	.733**	.231*	.133	.191	-.042	-.515**	.507**
GPMD4				1.000	.309**	.269**	.323**	.063	-.427**	.546**
SED8					1.000	.783**	.768**	.512**	.008	.630**
SED9						1.000	.791**	.569**	.057	.616**
SED10							1.000	.633**	.052	.687**
SED11								1.000	.472**	.328**
SED12									1.000	-.240*
SED13										1.000

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

7.3.4. Green Competition

Recently, many company boards have spent time considering green strategies and how to catch up with competitors who have already gone green. The respondents were asked to state the level of unpredictability in competition in relation to green issues. There are six related to the questionnaire. These are: unpredictability in competitors price changes of green products or services (GC1), unpredictability in changes in the green markets served by competitors (GC2), unpredictability in changes in the competitors green strategies (GC3), unpredictability in new competitors entry into the green market (GC4), unpredictability in domestic competitors (GC5) and unpredictability in foreign competitors (GC6). With regard to the issues in green competition, the respondents show that there is high predictability (exceeding 70%) (Table 7.18). In particular, these issues are more predictable in competitors at national and international level. It implies that executives are well aware of competitors and paying attention to their strategies, products and services.

Table 7.18. Frequency Table of Unpredictability in Green Competition (%)

N=103

Unpredictability	GC1	GC2	GC3	GC4	GC5	GC6
1	32.0	31.1	21.4	25.2	56.2	44.7
2	43.3	50.8	56.6	51.3	24.8	32.0
3	17.8	4.9	4.9	11.6	10.6	10.4
4	2.9	5.1	4.9	2.9	1.9	2.9
5	2.4	3.4	4.6	2.3	2.4	3.1
6	2.8	2.3	5.2	4.1	3.1	4.4
7	1.7	2.4	2.4	2.6	1.0	2.5
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

All variables were measured on a seven-point Likert scale.

As Table 7.19 shows, the unpredictability in green competition (GC) is significantly positively related to the level in top management commitment. It may explain why top executives consider green competition issues in their corporate vision and core business (SED1): corporate vision (SED1), executives' announcement of vision on green issues (SED2), environmental commitment and progress (SED3).

More precisely, the unpredictability in changes in competitors' prices of green products or services (GC1) and changes in the green markets served by competitors (GC2) are very positively related to the commitment in corporate environmental strategy and its vision (SED1). In addition, a significantly positive relationship between unpredictability in green competitors and frequency in executives' announcement of green vision (SED2), and environmental commitment and progress (SED3) is found. Thus, competitors bring more attention of top managers on green issues. In particular, when it is less predictable in competitors' prices of green products or services and competitors green markets changes, the association with the level in top management commitment is also high. It implies that top managers are well aware of those two issues and pay more attention on them. The correlation results are positive in the range of 0.267 to 0.575 which are all significant at p< .01. The results, therefore, support the proposition that the greater the perceived green environmental uncertainty caused by green competition, the higher the level in top management commitment.

Table 7.19. Correlation between Unpredictability in Green Competition and Frequency in Top Management Green Commitment

	GC1	GC2	GC3	GC4	GC5	GC6	SED1	SED2	SED3
GC1	1.000	.746**	.681**	.354**	.248**	.368**	.431**	.527**	.575**
GC2		1.000	.636**	.472**	.272**	.214**	.499**	.524**	.540**
GC3			1.000	.305**	.381**	.473**	.396**	.534**	.448**
GC4				1.000	.171	.160	.426**	.369**	.392**
GC5					1.000	.519**	.390**	.387**	.534**
GC6						1.000	.267**	.401**	.388**
SED1							1.000	.562**	.636**
SED2								1.000	.757**
SED3									1.000

** Correlation is significant at the 0.01 level (2-tailed).

As Table 7.20 shows, there is a significantly positive relationship between unpredictability in green competition and frequency of carrying out green analysis. This suggests that green competition issues are seriously considered or reflected in green analysis by top executives. Or detail green analytical tools and staffs are employed to green competition issues. Top managers also use green analysis tools for evaluating domestic competitors as well as foreign competitors (Table 7.20). The correlation results are positive and in the range of 0.253 to 0.663 which are all significant at p< .01. The results, therefore, support the proposition that the greater the perceived green environmental uncertainty caused by green competition, the higher the level of frequency in green analysis activities.

Table 7.20. Correlation between Unpredictability in Green Competition and Frequency of carrying out Green Analysis

	GC1	GC2	GC3	GC4	GC5	GC6	SED4	SED5	SED6	SED7
GC1	1.000	.746**	.681**	.354**	.248*	.368*	.501**	.593**	.512**	.545**
GC2		1.000	.636**	.472**	.272**	.214*	.640**	.663**	.527**	.512**
GC3			1.000	.305**	.381**	.473**	.550**	.452**	.470**	.445**
GC4				1.000	.171	.160	.362**	.344**	.398**	.299**
GC5					1.000	.519**	.531**	.488**	.532**	.372**
GC6						1.000	.318**	.253**	.342**	.530**
SED4							1.000	.713**	.612**	.601**
SED5								1.000	.633**	.621**
SED6									1.000	.688**
SED7										1.000

** Correlation is significant at the 0.01 level (2-tailed).

As Table 7.21 shows, there is in general a positive association between unpredictability in green competition (GC) and frequency in green scanning. Since green scanning involves monitoring and collecting various information with regard to green issues, it may be explained why top executives collect and interpret much information about green competition through green scanning. In other words, top managers where these issues are more uncertain use green scanning to collect information about changes in competitors' prices (GC1), green markets (GC2), competitors' green strategy (GC3), new competitors (GC4), domestic competitors (GC5) and foreign competitors (GC6). Then, their interpretation of collected information may be reflected in corporate environmental strategy. The correlation results range from –0.081 to 0.587 and six out of thirty six relationships are non-significant (P< .01). The results, therefore, generally accept the proposition that the greater the perceived green environmental uncertainty caused by green competition, the higher the level of frequency in green scanning.

Table 7.21. Correlation between Unpredictability in Green Competition and Frequency of carrying out Green Scanning

	GC1	GC2	GC3	GC4	GC5	GC6	SED8	SED9	SED10	SED11	SED12	SED13
GC1	1.000	.746**	.681**	354**	248**	368**	.457**	.495**	.466**	509**	341**	.199*
GC2		1.000	.636**	.472**	272**	214**	.412**	521**	504**	587**	.415**	.153
GC3			1.000	305**	381**	.473**	397**	502**	344**	504**	380**	.148
GC4				1.000	.171	.160	309**	343**	.427**	521**	306**	302**
GC5					1.000	.519**	558**	.478**	559**	.465**	.014	360**
GC6						1.000	.473**	.498**	.458**	.184	-.081	.482**
SED8							1.000	.783**	.768**	.512**	.008	.630**
SED9								1.000	.791**	.569**	.057	.616**
SED10									1.000	.633**	.052	.687**
SED11										1.000	.472**	328**
SED12											1.000	-240*
SED13												1.000

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

7.3.5. Green Technology

Investing in green technology is one of major strategic issues in corporate environmental strategy because reducing air pollution or waste is partly dependent upon the use of technology. Respondents were asked to state the level of predictability in technology related to green issues. The items in green technology include: changes in products green attributes (GT1), changes in design with green attributes (GT2), new product introduction with green attributes (GT3) and changes in the production process with green attributes (GT4). As Table 7.22 shows, there is a high level of predictability in green technology (GT). For example, changes in green product attributes (GT1) or new product introductions with green attributes (GT3) is highly predictable (exceeding 70%).

Table 7.22. Frequency Table of Unpredictability in Green Technology (%)

N=103

Unpredictability	GT1	GT2	GT3	GT4
1	23.0	29.1	25.2	28.0
2	53.4	42.7	41.5	41.7
3	5.8	12.3	12.4	21.3
4	2.9	4.9	5.8	1.9
5	6.6	6.7	7.0	2.2
6	5.2	3.1	6.2	1.3
7	3.1	1.2	1.9	3.6
TOTAL	100.0	100.0	100.0	100.0

All variables were measured on a seven-point Likert scale.

As Table 7.23 shows, there is a significant positive relationship between unpredictability in green technology and level of frequency in top management commitment. It may explain why top executives consider green technology issues in their corporate vision and core business with respect to corporate environmental strategy. In particular, unpredictability in changes in product green attributes (GT1) is highly positively related to commitment and progress of corporate environmental strategy and core business (SED3). Unpredictability in new green products (GT3), similarly, is positively associated with commitment in corporate core business and environmental strategy. Overall correlation results in Table 7.23 are positive in the range of 0.364 to 0.540 which are all significant at $p < .01$. The results, therefore, support the proposition that the greater the perceived green environmental uncertainty caused by green technology, the higher the level of in top management commitment.

Table 7.23. Correlation between Unpredictability in Green Technology and Frequency in Top Management Green Commitment

	GT1	GT2	GT3	GT4	SED1	SED2	SED3
GT1	1.000	.406**	.638**	.256**	.364**	.525**	.510**
GT2		1.000	.434**	.155	.398**	.472**	.533**
GT3			1.000	.274**	.405**	.460**	.540**
GT4				1.000	.374**	.437**	.438**
SED1					1.000	.562**	.636**
SED2						1.000	.757**
SED3							1.000

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

As Table 7.24 shows, there is also a highly positive association between unpredictability in green technology (GT) and frequency of carrying out green analysis. Since green analysis is involved with evaluation of new business opportunities and markets through analytical tools, it may be explained why green analytical tools or environmental specialists are very often employed to Research and Development (R&D) for new green products or changes in product green attributes. For example, top managers consider using of environmental specialists (SED6) in order to change of products with green attributes (GT1). It may imply that top executives believe green analytical tools and environmental specialists have positive impact on technological changes with respect to green issues. The overall correlation results in Table 7.24 are positive and in the range of 0.410 to 0.663 which are all significant at $p < .01$. The results, therefore, support the proposition that the greater the perceived green environmental uncertainty caused by green technology, the higher the level of frequency in green analysis.

Table 7.24. Correlation between Unpredictability in Green Technology and Frequency of carrying out Green Analysis

	GT1	GT2	GT3	GT4	SED4	SED5	SED6	SED7
GT1	1.000	.406**	.638**	.256**	.448**	.495**	.663**	.433**
GT2		1.000	.434**	.155	.465**	.437**	.477**	.531**
GT3			1.000	.274**	.461**	.455**	.546**	.413**
GT4				1.000	.459**	.410**	.487**	.484**
SED4					1.000	.713**	.612**	.601**
SED5						1.000	.633**	.621**
SED6							1.000	.688**
SED7								1.000

** Correlation is significant at the 0.01 level (2-tailed).

As Table 7.25 shows, there is a significant positive relationship between unpredictability in green technology and frequency in green scanning except social report (SED12). For example, an active monitoring of environmental issues (SED9) are closely related to changes in products green attributes (GT1), design change (GT2), new products (GT3) or production process (GT4). It may imply that top managers collect green information through green scanning for green technology, and reflect the information for technological change or development. Interestingly, frequency of publishing annual social report (SED12) has no positive relationship with unpredictability in green technologies. It may imply that social report is not relevant to technological change or development in top management view. The correlation results range from 0.171 to 0.571 and four out of twenty four relationships are non-significant (p< .01). The results, therefore, generally support the proposition that the greater the perceived green environmental uncertainty caused by green technology, the higher the level of frequency in green scanning.

Table 7.25. Correlation between Unpredictability in Green Technology and Frequency of carrying out Green Scanning

	GT1	GT2	GT3	GT4	SED8	SED9	SED10	SED11	SED12	SED13
GT1	1.000	.406**	.638**	.256**	.571**	.424**	.565**	.486**	.179	.336**
GT2		1.000	.434**	.155	.445**	.401**	.538**	.564**	.318**	.502**
GT3			1.000	.274**	.505**	.450**	.537**	.474**	.083	.432**
GT4				1.000	.531**	.521**	.375**	.242*	.050	.171
SED8					1.000	.783**	.768**	.512**	.008	.630**
SED9						1.000	.791**	.569**	.057	.616**
SED10							1.000	.633**	.052	.687**
SED11								1.000	.472**	.328**
SED12									1.000	-.240*
SED13										1.000

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

7.3.6. Green Stakeholders

Stakeholders seem to be increasingly influential on many company boards. Government regulators, the mass media or the local community is not new anymore to many board members. Since different stakeholders affect corporate environmental management in a different way, it is important to categorise and indicate the level of predictability and importance of each stakeholder into strategic management. In this section, respondents were asked to state the level of predictability of each stakeholder with regard to green issues. As Table 7.26 shows, the respondents show that there is a high predictability in the case of ten stakeholders. The respondents state that 89.1% of shareholders (GS1), 80.3% of regulators (GS3), 89.1% of media (GS6), 92% of NGOs (GS7), 92.1% of consumers (GS8), 86.1% of suppliers (GS9) and 90.1% of community (GS10) are highly predictable. Notably, 32% of respondents show no clear predictability in banks and financial institutes (GS2). Similarly, 31.9% of respondents in employees (GS4) and 40.7% in trade unions (GS5) show no clear predictability. It suggests that top executives do not consider banks and financial institutes (GS2), employees (GS4) and trade unions (GS5) are important stakeholders in corporate environmental strategy.

Table 7.26. Frequency Table of Unpredictability in Green Stakeholder (%)

N=103

Unpredic-tability	GS1	GS2	GS3	GS4	GS5	GS6	GS7	GS8	GS9	GS10
1	31.9	2.9	41.3	1.0	1.0	48.3	32.0	41.7	4.9	51.3
2	42.6	13.6	25.4	13.6	13.6	35.0	41.6	31.0	46.4	28.2
3	14.6	35.4	13.6	31.9	32.9	5.8	18.4	19.4	34.8	10.6
4	1.9	32.0	10.3	31.9	40.7	1.0	1.0	1.9	4.0	1.0
5	3.1	5.8	3.2	8.7	4.9	4.2	4.6	2.7	6.0	2.4
6	4.6	5.7	4.1	6.4	4.2	3.8	1.4	2.3	2.1	3.1
7	1.3	4.6	2.1	6.5	2.7	1.9	1.0	1.0	1.8	3.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

All variables were measured on a seven-point Likert scale.

As Table 7.27 shows, there is no positive relationship between unpredictability in green stakeholders and level of frequency in top management commitment except shareholders (GS1). Unpredictability in shareholders (GS1) only is positively related to frequency in three top management's green commitment activities: corporate green vision (SED1), executive's green vision announcement (SED2) and commitment and progress of environmental strategy in core business (SED3). It is obvious that shareholders are an important factor for respondents in their strategic management.

As shown in Table 7.27, the overall correlation results range from –0.296 to 0.425 and three out of thirty relationships are significant at the 0.01 level. The results, therefore, with the exception of shareholder, reject the proposition that the greater the perceived green environmental uncertainty caused by green stakeholders, the higher the level of top management commitment.

Table 7.27. Correlation between Unpredictability in Green Stakeholders and Frequency in Top Management Commitment

	SED1	SED2	SED3
GS1	.421**	.269**	.425**
GS2	-.007	-.066	-.057
GS3	-.082	-.252*	.078
GS4	-.028	.040	.054
GS5	.126	.067	.215*
GS6	-.142	-.066	.014
GS7	-.070	-.114	-.047
GS8	.228*	-.118	.098
GS9	.329**	.128	.149
GS10	-.113	-.296**	.091

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
Full correlation matrix is given in Appendix 7.1.

The overall correlation results range from –0.200 to 0.449 and two out of forty relationships are significant at the 0.01 level (Table 7.28). The results, therefore, with the exception of shareholders, reject the proposition that the greater the perceived green environmental uncertainty caused by green stakeholders, the higher the level of frequency in green analysis.

Interestingly, there is no positive relationship between unpredictability in green stakeholders and frequency in green analysis except shareholders (GS1). Unpredictability in shareholders (GS1) only has a positive relationship with frequency in environmental evaluation tool (SED4), usage of in-house environmental professionals (SED6) and usage of outside environmental consultants (SED7). Thus, shareholder seems to give more uncertainty to many top managers and make them to carry out more frequent analysis to reduce the level of uncertainty.

Table 7.28. Correlation between Unpredictability in Green Stakeholders and Frequency of carrying out Green Analysis

	SED4	SED5	SED6	SED7
GS1	.214*	.185	.434**	.449**
GS2	-.010	-.108	.009	.169
GS3	-.065	-.200*	-.064	-.137
GS4	-.221*	.009	-.191	.130
GS5	.088	.032	.223*	.232*
GS6	-.136	-.085	-.087	.067
GS7	-.163	-.112	-.015	-.110
GS8	-.061	-.042	.184	.004
GS9	.151	.232*	.091	.139
GS10	-.031	-.166	-.016	-.067

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
Full correlation matrix is given in Appendix 7.1.

The overall correlation results range from –0.438 to 0.436 and eleven out of sixty relationships are significant at the 0.01 level (Table 7.29). The results, therefore, with the exception of shareholders, reject the proposition that the greater the perceived green environmental uncertainty caused by green stakeholders, the higher the level of frequency in green scanning.

Unpredictability in shareholders (GS1) only has a positive relationship with frequency of green scanning. It gives an explanation for top managers why they spent more time and resources for scanning more frequently when they perceive uncertainty of shareholders. It other words, Once top managers perceive shareholders important with uncertainty, they seek more information to understand and reduce the level of uncertainty.

Table 7.29. Correlation between Unpredictability in Green Stakeholders and Frequency of carrying out Green Scanning

	SED8	SED9	SED10	SED11	SED12	SED13
GS1	.509**	.398**	.401**	.267**	.097	.433**
GS2	.231*	.122	.100	-.078	-.438**	.432**
GS3	-.079	-.002	.079	-.176	-.366**	.195*
GS4	.040	.042	.151	.024	-.137	.180
GS5	.266**	.336**	.113	-.002	-.188	.436**
GS6	.122	-.013	.005	-.051	-.105	.155
GS7	-.084	-.118	-.117	-.009	-.053	-.081
GS8	.207*	.083	.024	-.054	-.119	.156
GS9	.050	.164	.186	.224*	-.136	.154
GS10	.060	.144	.037	-.141	-.179	.212*

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
Full correlation matrix is given in Appendix 7.1.

7.4. Conclusion

This chapter has presented the survey findings. The findings reported above answer the research question, "how do executives perceive green environmental uncertainty, and how is perceived uncertainty related to strategic management issues?" The perceived green environmental uncertainty has six different domains as government environmental policy, environmental resources and services, green products, markets and demand, green competition, green technology and green stakeholders. The perceived green environmental uncertainty, here in this research as unpredictability, was tested on three different strategic management issues: top management commitment, green analysis and green scanning. The relationship between the level of unpredictability and the commitment to strategic management activities is the objective to examine in the survey.

Positive significant relationships are found between unpredictability in government environmental policy, green competition and green technology and strategic management issues. The results show that executives' perceived green environmental uncertainty in government environmental policy, green competition and green technology influence to three strategic management issues, top management commitment, green analysis and green scanning. That is, when executives perceive greater green environmental uncertainty caused by these three factors, more frequent activities in top management commitment, analysis and scanning are carried out.

In contrast, no positive significant relationships are found between unpredictability in environmental resources and services, green products, markets and demand, and green stakeholders and the frequency in strategic management issues. The results show that executives' perceived green environmental uncertainty in environmental resources and services, green products, markets and demand, and green stakeholders does not influence strategic management issues as top management commitment, green analysis and green scanning.

The survey reveals that decision-makers *selectively* perceive green environmental uncertainty and selected perceptions give influences on activities in strategic management issues. The results, therefore, confirm that strategic choice is made by decision-makers who selectively perceive their environmental uncertainty, here green environmental uncertainty (Child, 1972; Miles and Snow, 1978).

However, there are some exceptions in the survey findings. For example, positive relationships in part are found between unpredictability in environmental resources and services and level of top management commitment. Also, unpredictability of shareholder in green stakeholders has always positive significant relationship with the frequency in strategic management issues. More importantly, the survey found that respondents aware green environmental uncertainty, but didn't give detail explanations why they do or don't take strategic actions. These exceptions are still remained not answered in the survey analysis. Therefore, it is necessary to carry out interviews and case studies for providing additional information and in-depth understanding which is not found in the survey.

Chapter Eight

Qualitative Data Analysis

8.1. Introduction

The objective of this chapter is to present the findings from the qualitative data analysis, i.e. the interviews. The interviews sought to provide additional data and information for survey data. The interviews were conducted in fifteen companies with a total of 61 corporate executives or managers holding equivalent positions during the period March to May of 2000. All interviews were conducted with one executive alone. The computer software programme NUD*IST was employed to analyse interview data. As mentioned earlier in chapter 6, there are five key questions to ask about how corporate executives perceive "green" environmental issues, and how they incorporate these issues in their strategic decision making. These are:

- the background of respondents (name, organisation, position)
- the respondents' awareness and knowledge of green issues and their opinion on environmental issues
- problems or risks respondents face integrating environmental issues in strategic decision making
- the reasons why respondents take environmental issues in business strategy
- the respondents' opinion on the relationship between green issues and strategic making

The following sections give findings and responses to these key issues.

8.2. The background of respondents

The respondents' job titles demonstrate the seniority of their positions. For example, chief executive officers made up nearly 25% of respondents and other senior members of boards also gave a relatively significant percentage of interviews (Table 8.1). Seniority is considered important because obtaining top management's view on green issues and strategic concerns is one of main goals of this research.

Table 8.1. Respondents Position

Position	Number	Percentage
Chief Executive Officers	15	24.6%
Corporate Vice Presidents	6	9.8%
Directors of Environmental Affairs	17	27.9%
Directors of Environment and Safety	13	21.3%
Directors of Manufacturing	4	6.6%
Directors of Marketing	6	9.8%
Total	61	100%

Since most respondents don't want to reveal their names or names of organisations in the thesis, these are kept confidential. This arrangement may give a better opportunity to uncover sensitive issues in strategic decision making such as the importance of green issues in site location decisions.

8.3. Respondents' Awareness and Knowledge of Green Issues

The term "awareness" most often has to do with the public's interest in knowing about what was going on in the environment. In the 1970s and 1980s there was considerable environmental "awareness" but very limited environmental knowledge, that is the information needed to make decisions about appropriate levels of environmental protection and improvement. The Environmental Director at company 2 said,

"In the 1970s and 1980s, nobody had ever been there before. That's where the uncertainty was. But it was clear that industry wasn't quite sure what to do."

This trend has changed in the 1990s. Many senior managers are well aware of environmental issues as part of business activities. For example, a Corporate Vice President at company 4 said,

"It is not surprising to see the title of environmental hormone, plastic wastes, energy consumption, hazardous wastes, air pollution and noise in the newspaper. For instance, energy intensified production and consumption is one of characteristics in chemical industry. It has some impact, in my opinion, on global warming."

Similarly, Vice President at Company 7 states,

"There are clear environmental issues which we face quite seriously. For instance, there are environmentally hazardous compounds and raw material management, pollutant emissions during the manufacturing production process, wastes after usage, energy intensified production process. We have expert staff and teams to handle all these issues. Many of the systems are based on international standards such as BS 7750, ISO 14001".

As shown above, many executives are aware of environmental or green issues. It is noticed that executives raise awareness of the issues through an interim environmental report or environmental audit, which provides an integrated, holistic snapshot of a firm's current environmental performance. One of directors of environmental affairs said,

"I have a responsibility to produce an interim environmental report every three months. I participate in board meetings and make briefings based on the interim report which I produce. Since the vice president has direct responsibility for our environmental audit and report, I have a regular meeting with him every month. He checks environmental performance and progress with target indicators carefully. I remember when we achieved ISO 14001 last April, he stood up and shook my hand with a big smile."

During the interviews with corporate executives, eight themes in corporate environmental management were identified. As Table 8.2 shows, waste minimisation, recyclability and life cycle assessment were the most frequently cited themes of corporate environmental management. Since life cycle assessment (LCA) is a computer-based tool to evaluate environmental impact of products, managers working on waste minimisation and recyclability seem to adopt LCA for assessing environmental impacts and demonstrating current and potential impacts on the natural environment. Thus, executives were well aware of the issue of waste minimisation and recyclability, and paid most attention to these issues in corporate environmental management. In addition, environmental risk assessment and eco-audit were frequently cited by executives. Since these are tools to give overall picture of a firm's current environmental performance, executives review green issues through use of environmental risk assessment and eco-audit.

Table 8.2. Current Corporate Environmental Themes

Corporate Environmental Themes	Number of Citations	Rank
Recyclability	**198**	**2**
Reuse	161	4
Waste Minimisation	**230**	**1**
Green Design	43	8
Life Cycle Assessment	**172**	**3**
Environmental Performance-Measurement	96	7
Environmental Risk-Assessment	149	5
Eco-Audit	124	6

Note: NUD*IST4 programme is used for checking and examining interview data.

Although, many corporate environmental themes are, in general, consideration in all companies, there are some difficulties which reflect the level of understanding of the themes. As the CEO of company 11 pointed out, there are many outside stakeholders who take up environmental issues against many local facilities, but few people have a clear understanding of environmental issues. CEO at company 11 continues,

"The *environmental activists and other NGO groups around local manufacturing and disposal facilities kind of latched on to the idea of source reduction. And nobody knew exactly what it was and we spent hours during these first meetings to define what it meant and all that type of thing. But it was an idea which was not well defined but which people were starting to struggle with. And the instinct was, there has to be a better way."*

Similarly, the director of environment and safety at company 11 explains his own experience about difficulties in making decisions,

"When you think about changing production, don't only think about what happens to one waste stream, hazardous waste, and what its relationship is to these other entities where the waste can be recycled or something like that. Think about what that decision to

recycle that waste means to the whole system. It means that you are sustaining that type of destructive technology or harmful technology, which has implications outside the company before any materials are ever brought there, and after materials or goods are created, and then by recycling some of the hazardous waste here, you are not dealing with any of these other routes of releases and exposure. Your are actually postponing the day when these are going to have to be addressed because people think you have solved the problem by dealing with a very small area of the problem actually. With hazardous waste recycling, you still have air emissions, water discharges, toxic products, consumer exposure, transportation accidents, and potential for release through transportation and movement of the materials all over throughout society."

The point which director at company 11 made here is that he had to make decision in some case even though he has very limited understanding of certain green issues and the system as a whole.

To sum up, there was an increasing level of awareness of green issues by many companies. In order to respond to green issues, awareness is a first step. However, many companies are uncertain about how to proceed, and fear a backlash from consumer and environmental groups. With regard to green issues, the respondents' uncertain and reluctant behaviour seems to have resulted from the low level, or even a lack of understanding of green issues. In other words, executives' views of green issues are very different from others. Some "leading" companies view green issues as a new business opportunity while some "lagging" companies only see the cost issue. Thus, the following conclusions can be drawn. First, managerial awareness of green issues is uneven, focusing on a few high-profile environmental symptoms which often overlooking the underlying causes. Second, the awareness of the green issues and the understanding of the issues are not yet matched by actions, or the integration of green issues into business strategy.

The following section of "problems respondents faced integrating green issues in strategic making" is presented as additional evidence which may explain why some top managers are lacking of understanding of green issues even though they are aware of green issues.

8.4. Problems and Risks in Integrating Green Issues into Strategic Decision Making – Information Perspective

Since information is a tool which supports strategic decision making, the nature of available information and its sources are investigated in the interviews. For instance, the Vice President at company 11 said,

"We have different information sources. As a senior board member, I need supports to make my own judgement with regard to certain strategic issues including "green" issues. So reliable and predictable information is crucial for us. When I examine certain situations and markets, I hope to make right judgements. Here, the right information is crucial for that judgement. But if I don't have right information or timely information which is useless for the future direction of the market, then I could be in trouble in making my decision. That's one of the hardest decisions I must take. In such cases, other members of the board and I discuss the matter of lack of accurate and reliable information. Sometimes I am frustrated by the quality of facts and information which government bodies provides because the data is occasionally not well prepared or is not very recent information."

Table 8.3 shows the different sources of information and their popularity which are used by many companies and senior managers.

Table 8.3. Sources of Environmental Information

Issue	Number of Citations	Rank
ISO14001	232	1
BS7750	196	2
EMAS	75	5
Code of Conduct	138	4
Environmental legislation	143	3

Note: NUD*IST4 programme is used for checking and examining interview data.

As Table 8.3 shows, the respondents rely upon international standards such as ISO14001 and BS7750. The reason is related to the purpose of ISO14001. That is, the purpose of ISO 14001 is to "provide organizations with the elements of an effective environmental management system…to assist organizations to achieve environmental and economic goals (ISO, 1996)." In order to gain ISO 14001 accreditation, there is a need to provide the information required to determine the company's progress toward its environmental objectives. In other words, measurement, monitoring, documentation and data management require the provision of information to judge process and progress toward environmental goals. Many senior managers seem to believe that preparing to obtain international standards is to meet both national and international standards. In addition, it is a part of doing benchmarking.

According to Vice President at company 6,

"In order to achieve international standards and carry out benchmark, we keep in touch with international organisations, institutions, body, law firms, other strategic global partners, governments. So we can predict certain global trends of environmental

regulation, system or standards. For doing this, accurate and timely information is very important to prepare and develop our corporate strategy including environmental strategy. Upgrading information and contacts is another important matter because it gives us more time to prepare our systems and standards properly. Ultimately, this information brings extra capabilities for competing with our competitors."

Similarly, CEO at company 14 said,

"If our top management team perceives certain environmental issues as crucial or very important, then we collect data and information extensively about them. During this information collection period, availability of timely and adequate information is crucial. Then we bring this information into our board meetings, to discuss and incorporate into our strategic management. Also, sharing information is quite important. For instance, we have a strategic partnership with Dow Chemical. In the environmental context, we share information with Dow Chemical. So we can give and receive feedback to each other. There are also opportunities to learn some advanced level of handling system or management tools. Lack of information could come wrong decision or disaster to the top management team, even in our company."

To summarize, respondents were aware of green issues in general but their level of understanding of these issues was low. This lack of understanding can be rooted in information and its quality. Most respondents acknowledge that accurate and timely information on green issues is essential for their corporate environmental strategy. More is expected from government in terms of supplying information and guidance to stimulate greening in corporate environmental management. The respondents show that they prefer international standards such as ISO14001 and BS7750 as an information source to government regulations. In addition, preparing to gain international standards bring extra benefits including saving costs and time in the future, and benchmarking. There are also risks which top managers can make wrong decisions because of shortage of information, non-accurate and untimely information as well as lack of understanding. These wrongly guided decisions can be crucial for companies future markets or directions. Therefore, green scanning and analysis activities seem to contribute to reduce the level of risks which companies can face at present or in future.

8. 5. Reasons for Adopting "Green" Issues in Business Strategy

There are both external and internal reasons for adopting environmentally conscious strategies in business operations. The internal reasons reflect a proactive stance toward the use of environmental strategies as a source of competitive advantage. The external reason is mainly in response to regulation from governmental bodies and product and environmental liabilities.

Once the respondents are aware of green issues and/or pressures, the question "what factors are directly or indirectly connected to their corporate actions" was asked. Six factors – regulation, corporate image/reputation, cost, public awareness/pressure, technology and stakeholders – are identified as major factors for corporate strategic environmental decision-makings.

8.5.1. Regulations

The nature of some environmental laws and regulations trend to perpetuate the growth of more of the same with the consequence that valid decisions made concerning one rule often overlap others that make no sense when considered in their context. Government regulations play a key role in influencing environmentally sensitive business operations. For example, the environmental protection agency (EPA) formulates guidelines on the acquisition of environmentally preferable products and services that are applicable to government procurement of all kinds of consumer and commercial products and services (Bryson and Donohue, 1996).

For example, the CEO at company 4 said,

"Government regulation compliance is an important objective in our plan and strategy. We want to demonstrate our commitment to comply with government regulations and standards, so we can develop long-term strategies to meet or even develop beyond those regulations and standards."

Similarly, CEO at company 11 said,

"The decade of the 1990s is going to be the decade of enforcement. I think you will keep seeing laws and regulations but not at the clip that we are used to seeing them. I think what you are seeing now are the agencies like the EPA and the Government (Ministry of Environment) spending a lower percentage of their total time on writing regulations and a greater percentage of their total time on their enforcement. And they have also got some pretty stiff penalties into the more recent regulations. For a selected few, however, the short term focus on compliance was merely a necessary intermediate step that would generate much needed credibility in the eco-world and allow for the development of longer-term solutions to the waste problem through source reduction. Any break in that undeclared truth – such as the one by the environmental group which campaigned aggressively – would only divert more resources in public relations and abatement, thus forestalling efforts in source reduction."

As shown above, government legislation has a significant impact on corporate environmental management. In addition, the respondents agreed that international standards and regulations have an important impact on corporate environmental management.

8.5.2. Corporate Image/Reputation

Environmental protection is of strategic importance for corporate image or reputation. Having a sound environmental record and good corporate environmental management can provide competitive advantages on the corporate image or reputation front. This view can be found from CEO at company 12.

"In the company's history, the terms "environment" or "ecology" were not used but their essence was captured by phrases equivalent to "our company name appeared in the newspapers", "the incinerator ought to be shielded by drivers", "we are capable of producing products that do not litter", and so on. Even in the few instances they were used, they served to illustrate the environmental component in an image preservation."

CEO at company 11 had a similar view:

"We had initially when we built the facility, the primary manufacturing plant in the old town for chemicals, we had built a batch still, a distillation unit, along with the plant, which was built in 1970 completed in 1971. The distillation unit had not been used. So one of our goals was to operate it fully. Targeting reduction of waste which was going out to disposal facilities, that was out emphasis. Because of the cost per gallon of disposal we were paying, the concern about potential legal penalty sites are our major targets. In the late 1970s a company we had used for a few years for waste disposal, particularly the drum materials, closed and eventually became a legal penalty site that we were involved

in. So awareness started to set in around that time, that we should be doing less with these outside firms in order to minimise our exposure. More importantly, our corporate reputation was at risk which might be damaged by the media and other NGOs."

As shown above, the respondents show that corporate image and/or reputation can be at risk when the media or NGOs raise green issues. It seems that many companies are still reactive to defend firms' image or reputation from the media and other pressure groups such as Green-peace. Some companies take a proactive dialogue or PR strategy to make their image and/or reputation "environmentally friendly" or "greener".

8.5.3. Cost

Cost is another major factor for corporate environmental management. When green issues are discussed at the board meetings, investment on environmental technology or design or production of new green products means cost first, and profit later. Since end-of-pipe measures in the industry are becoming increasingly more expensive: each reduction in pollutants – over and above the latest state-of-the-art technology - of a few parts-per-million requires a very high outlay on technology and consequently high investment costs. It was not difficult to obtain respondents' experience on cost issues at board meetings. CEO at company 12 said,

"I bring the environmental report at the meeting, and make brief suggestions for making extra investment for new designs for environmentally friendly products. But the marketing director immediately says that we have a great market position and are making good profits. Why should we bother to spend more money for a new design now? After a short break, I go back to the meeting and try to persuade directors or other members of the board 'look, it is time to demonstrate our company's in the global market with global

standards. We need to move beyond our current standard level of thinking. Making investment does not simply mean a cost. It is a means for us to prepare for our future. Finally, my proposal is accepted."

As shown above, cost clearly has an impact on corporate environmental management. However, top executives may take proactive approaches to green issues when they see opportunities rather than threats.

8.5.4. Public Awareness/Pressure

It is not surprising executives face increasing public pressure with regard to green issues. Vice president at company 6 said,

"The concern about being in the public eye was paramount in the minds of most members of boards. At some level, therefore, success was measured by the effectiveness of any practice that would guarantee the redemption of the firm in public."

Public participation is concerned with the efforts expended in order to obtain the views of, and to inform, those members of the public who may be affected by the business activities. These efforts would appear to be essential if strategic planning is to be sensitive to social and environmental values concerning the use of affected environmental resources. However, there are some doubts public pressures or voices are reflected on corporate environmental management even though companies organise meetings with the public with regard to green issues. In other words, having meeting with the public does not always mean companies are carrying out proactive corporate environmental management. It may be a part of their PR.

8.5.5. Technology

Considerable attention to environmental aspects of technologies was evident in the facilities employing more standardised technologies, but which still had associated unsolved environmental problems. In the petroleum refinery, for example, a great deal of engineering effort was expended in finding solutions to problems of noise, glare, odor, water reuse and oil spills. Many modifications were incorporated directly into the process scheme prior to the design of terminal treatment facilities. An entire process idea in the petrochemical facility, that of shipping liquid chlorine, was eliminated early in the strategic planning exercise as it was judged to be "environmentally too risky." Although there is available technology for environmental improvement or green issues, some respondents show that there are obvious limitations to taking proactive responses because of the characteristics of the chemical industry. According to one director,

"most raw material is petrochemical, and very dangerous material. So when we look for new sites for building facilities, we make sure first of all surroundings are acceptable for building new facilities. If there are some issues we must take care of, we use where possible advanced technology to reduce noise and pollution. However, taking full responsibility from the design of new facilities is not easy to do. Because there are some criteria for choosing new sites locations, we carry out our work based on these criteria. However, environmental or green concern is still a minor issue for us."

As shown above, technology has certain impact on corporate environmental management. However, respondents show that there are obvious limitations to use technology to cover the whole corporate environmental management area.

8.5.6. Stakeholders

On the whole a rather low level of stakeholder commitment to strategic planning was found. Strategic planning was rarely an open and participatory process. Most often it was secretive, exclusionist, low profile and "official channels only" in character.

Community and citizens environmental group input was actively sought during strategic planning in only a few of the cases examined. The most extensive effort was observed in conjunction with a proactive company group. In this case a hybrid committee of company executives and representatives from local citizen conservation groups was created during the early stages of project planning. The committee met periodically over a long period to discuss, monitor and make suggestions about the development of the company. Although both sides were apprehensive at first – the conservationists afraid of public relations gimmickry, and the company of unreasonable demands a deep sense of mutual understanding and trust reportedly grew as the committee worked together. The company's environmental director, who was principally responsible for launching the effort, stated that the committee experiment had the following benefits: it opened up avenues of communication with those holding strongly conservationist points of view; it brought into the strategic planning process a broad range of necessary and low-cost environmental expertise; it helped to prevent the development of an atmosphere of emotionalism, animosity and distrust; it perhaps reduced the potentialities of media battles and legal action; it appeared to increase public and citizen group acceptance of the plan, and in general, resulted in a plan in which many potential environmental problems were eliminated or at least minimised and controlled.

For example, executives from the firm planning the petroleum refinery discussed the plan with a wide range of community organisations: scientific institutes, schools, political parties, community clubs, trade unions, and local NGOs groups. In the offshore oil project, the firm's planners and environmental staff had broad-ranging consultations about the pipeline route with representatives of a number of conservation, wildlife, farming, fishing and ecological research groups. As expressed by one executive,

"We attempted to approach virtually every proprietor, occupier, and interest group likely to be affected and listen to their concerns." In the petrochemical complex project, consideration and seeking local opinion was demanded by law: as the project manager was instructed by the director of the environmental protection agency – "local opinion must be sought."

More circumscribed efforts to seek out local input were observed in three cases. In these cases, discussions or negotiations with a limited range of local interests was the general pattern observed. No attempts to seek local advice were made at all in ten cases. Discussions were restricted to the relevant public authorities. One CEO explained the lack of advice seeking as follows:

"there were just not enough qualified people in the village who could understand what we would be talking about. We haven't found a good way to translate the difficult technical problems for people who don't have any understanding of that side of the business."

Some executives claimed that such efforts are not really necessary as the local public planning agency is usually capable of looking out for the interests of the community. A few firms appeared afraid of interacting with citizen environmental groups, viewing them more or less as uncompromising radicals intent only on promoting chaos in order to delay or block the project. As one senior manager expressed, *"we prefer to deal with these groups only in the context of a well-controlled formal public hearing."*

8.6. Respondents' opinion on the relationship between green issues and strategic making: site location case

By and large, environmental impact considerations were not found to be a prime factor in site selection in major strategic decisions. Since site selection was primarily based on the criteria of market, transport, labour, energy, tax, construction, geographical and engineering factors, inputs from ecological investigations were generally not available when site decisions were made.

Most site locations are determined by following issues:

- location of oil/gas pools
- access to existing integrated facilities
- access to industrial markets
- access to low cost power
- access to raw materials supply
- access to deepwater port

Raw materials access appeared to be the key factor in the chemical industry. For example, polypropylene and polyethylene facilities were both located adjacent to petroleum refineries for supplies of propylene and ethylene, respectively. The site of petrochemical facilities was chosen because of convenient access to salt and natural gas supplies. In the case of pipeline-related facilities, key issue to select the site depended on access to existing facilities, either backward to production operations or forward to marketing operations. Low cost and available power was also expressed to be the dominant site selection criterion. Access to deepwater ports capable of handling deep draft vessels appeared to be a dominant requirement in the case of the petroleum refinery and the Liquefied Natural Gas (LNG) import terminal.

The finding that ecological considerations were generally not prime factors in site selection does not mean, however, that they were entirely absent. The pipeline routings involved in the natural gas pipeline and offshore oil development facilities, for example, were done with ecological criteria in mind, even though the locations of other facilities were pretty much resource fixed. In the offshore oil facilities, the land-based pipeline sitting was done partially on the basis of an environmental impact assessment of land form and land use. According to Vice President at company 13,

"Four criteria were employed in evaluating the potential locations. First it had to be located off stream to minimise the possibility of water pollution. Second, it had to be located so that the danger of flooding would be eliminated. Third, it had to be economical, and finally it had to be exposed as little as possible to public view. Of the twelve sites, only three were found to be environmentally satisfactory and one of them was chosen for our facility."

The indirect influence of environmental considerations on site location was seen to be operating in a few other cases. In the case of the petroleum refinery, the firm had been blocked in expanding and modernising a nearby existing refinery because of residential encroachment (i.e. housing units right up to the plant fence).

One chemical firm had selected its isolated site largely for non-environmental reasons, but when evaluated on an after the fact basis, found that they had chosen a good site for future plans that might involve problems such as flaring and noise.

8.7. Conclusion

This chapter has presented the findings from qualitative data analysis. The findings reported above are generally consistent with those reported earlier in survey findings, chapter 7. Based on the findings, it is possible to draw the following conclusions.

First, managerial awareness of green issues is variable. The respondents often focused on a few highlighted green signals which often overlooked the underlying causes. In chapter 7, green environmental uncertainty in general has been positively related to top management commitment. Although most respondents show high predictability in green environmental uncertainty, the reasons behind their answers were not very clear. That is, they show high predictability because they are aware of green issues, but there was little evidence of respondents' understanding. The findings from the interviews reveal that the awareness of green issues is increasing but understanding of the issues is uneven. In other words, corporate actions, or the integration of green issues into business strategy does not yet unite awareness and understanding of the issue.

Second, the lack of issue understanding can be resulted from inaccurate and untimely information of green issues. Although respondents have various information sources, they frequently face information-overload caused by old and untimely information. Thus, respondents seem to rely on international standard or regulation as their information source to reduce uncertainty resulting from inappropriate information rather than adopting government regulations only.

Third, six factors (i.e., regulation, corporate image/reputation, cost, public awareness/pressure, technology and stakeholders) are identified as major factors for corporate action in environmental management. These factors are internally and externally influenced, but the level of acceptance is dependent upon top executives' attitude and perception. It means there could be environmentally "leading" or "lagging" companies resulted from top executives' attitude and perception. For example, when top executives give priority on corporate image/reputation, firms will adopt a proactive corporate environmental strategy to protect or improve their image/reputation. The interesting point here is corporate focus is different when top managers perceive green issues as opportunity or threat. For example, when top managers at environmentally "leading" companies perceive green issues as opportunities, their strategic focus becomes more proactive to take an opportunity to achieve strategic goals. In contrast, when top managers at environmentally "lagging" companies perceive green issues as threats, their strategic focus becomes more reactive to defend their current resources and markets. The survey findings in chapter 7 also support this. That is, the level of corporate greening actions depends upon top executives' commitment and the level of green environmental uncertainty. These findings imply that different companies have different priority to adopt some of six factors which identified in the interviews.

In order to figure out how companies take actions differently because of top managers' different perception such as opportunity or threat, case study is carried out and described in chapter 9.

Chapter Nine

Case Study Analysis

9.1. Introduction

This chapter describes 15 case studies and these analysis. Analysing case studies is mainly based on interview and documentary data. In order to ensure validity, cross checking the interview data, financial and environmental performance data and some other additional documentary data are used. As discussed earlier in chapter 6, the case study method is chosen because it is the preferred method when "how" or "why" questions are being posed. In this study, the research question "how executives perceive green issues, and how and why executives integrate green issues in strategic management" is investigated. There are two main reasons why case study approach used in this study. These are i) to obtain more information on the research subject and ii) to explain and illustrate qualitative findings in more detail and expand quantitative findings. In order to meet these two aims, the following steps in the case study are applied. First, categorise topics in top management commitment and corporate environmental management. Second, develop indicators for rating companies under these categorised topics. Third, develop major dimensions of corporate greening based upon indicators and company rating. Fourth, identify patterns of corporate greening using cluster analysis. Fifth, describe corporate greening patterns, and their relationship with financial and environmental performance.

9.2. Description of the Interview Data in Case Study

Fifteen case studies were made. Each company case is related to a single. Main topics described in each case study are: top level commitment to strategic management and different business activities with relation to green issues.

In top level commitment, the following issues are included:

- Top level responsibility
- Environmental policy
- Strategic planning
- Stakeholder involvement

In business response to environmental issues, the following issues are included:

- Environmental performance
- Environmental report
- Environmental management system (EMS)
- Environmental standards
- Record of fine and penalty
- Environmental liability
- Eco-products

In order to identify the above issues, an evaluation sheet is designed and developed for case study (Appendix 9.2). Total 19 questions are designed to investigate the above topics. The value of question is ranged from 0 to 1. This development of an environmental sustainability evaluation sheet provided a quantified qualitative data and basis of comparison between companies.

9.3. Case Studies

The interview data were analysed using a procedure based on the repertory grid methodology (Smith, 1986). The method used here is to identify similarities and differences of the companies based on the interviews. This method allows the qualitative data to be evaluated and transformed into quantitative values which can then be used for further analyses.

The results obtained from this analysis were assessed by comparing them to the results obtained from a conceptually clustered matrix analysis (Miles and Huberman, 1994). According to Miles and Huberman (1994), a conceptually clustered matrix was developed by bringing together items that "belong together" (p.127). This method uses descriptive displays of the data to identify common themes.

The matrix in Table 9.1 was analysed using cluster analysis to identify similar groupings of evaluative indicators. This grouping process reduces the number of indicators and helps to identify common themes in the qualitative data. Since the main purpose of the tool was to develop indicators and quantify the qualitative data for comparison among 15 companies, quantified data based on indicators rating is used for cluster analysis (the developed evaluation tool is described in Appendix 9.1). Also, a metaphorical labelling is given to each cluster groups because metaphors can be used to clarify or compare, creating emphasis and a fresh perspective, particularly with regard to complex or ambiguous issues or experiences (Sackmann, 1989).

Table 9.1. Qualitative Data Indicators and Company Ratings

Evaluation Indicator Scale: 0 (low)- 1 (high)	Companies														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Top level responsibility	2	2	1.5	2	1.5	2	2	2	1.5	2	2	2	2	2	2
2. Environmental policy	0.5	1	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	1
3. Stakeholder involvement	1	1	0.4	1.2	1	1.2	0.5	0.6	1.3	1.3	1.2	1.2	1.3	1.4	1.5
4. Strategic planning	0.25	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.5
5. Environmental performance	0.35	0.35	0	0.35	0.1	0.35	0.1	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
6. Environmental report	0.2	0.2	0	0.2	0	0.2	0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
7. Environmental management system	1.7	1.3	0.2	1.3	1.1	1.3	1.3	1.1	1.3	1.3	1.1	1.1	1.3	1.3	1.1
8. Environmental standard	1.1	1.3	0	1.3	1.1	1.3	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
9. Record of fine & penalty	1	1	0.25	1	1	1	1	1	1	1	1	1	1	1	1
10. Environmental liability	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11. Eco-product	0.5	0.5	0	2	0.5	1	0.5	0	2	0.5	0	2	2	2	2
TOTAL	8.6	9.15	3.1	10.6	7.05	9.1	7.25	7.1	9.5	8.5	7.7	9.7	10	10.6	10.75

In order to identify different dimensions of corporate greening, three devised themes are summarised as: top management commitment, strategic importance of green issues and operational performance on green issues. Top management commitment includes top level responsibility and environmental policy. The rating score of top management commitment can be calculated by adding the score of top level responsibility and environmental policy. Strategic importance of greening issues includes strategic planning and stakeholder involvement. The rating score of strategic importance of green issues can be calculated by adding the score of stakeholder involvement and strategic planning. Operational performance on green issues includes environmental performance, environmental report, environmental management system, environmental standards, record of fines and penalties, environmental liability and eco-products. The rating score of operational performance of green issues can be calculated by adding the scores on these issues. Table 9.2. presents three different dimensions of corporate greening. All scores used in Table 9.2 are obtained from Table 9.1.

Table 9.2. Dimensions of Corporate Greening

Dimensions of Corporate Greening			
Company	Corporate Greening Themes		
	Top Management's Commitment	Strategic Importance of Green Issues	Operational Performance of Green Issues
1	2.5	1.25	4.85
2	3	1.5	4.65
3	2	0.65	0.45
4	3	1.45	6.15
5	2	1.25	3.8
6	2.5	1.45	5.15
7	2.5	0.75	4.0
8	2.5	0.85	3.75
9	2.5	1.55	5.95
10	2.5	1.55	4.45
11	2.5	1.45	3.75
12	2.5	1.45	5.75
13	2.5	1.55	5.95
14	3	1.65	5.95
15	3	2.0	5.75

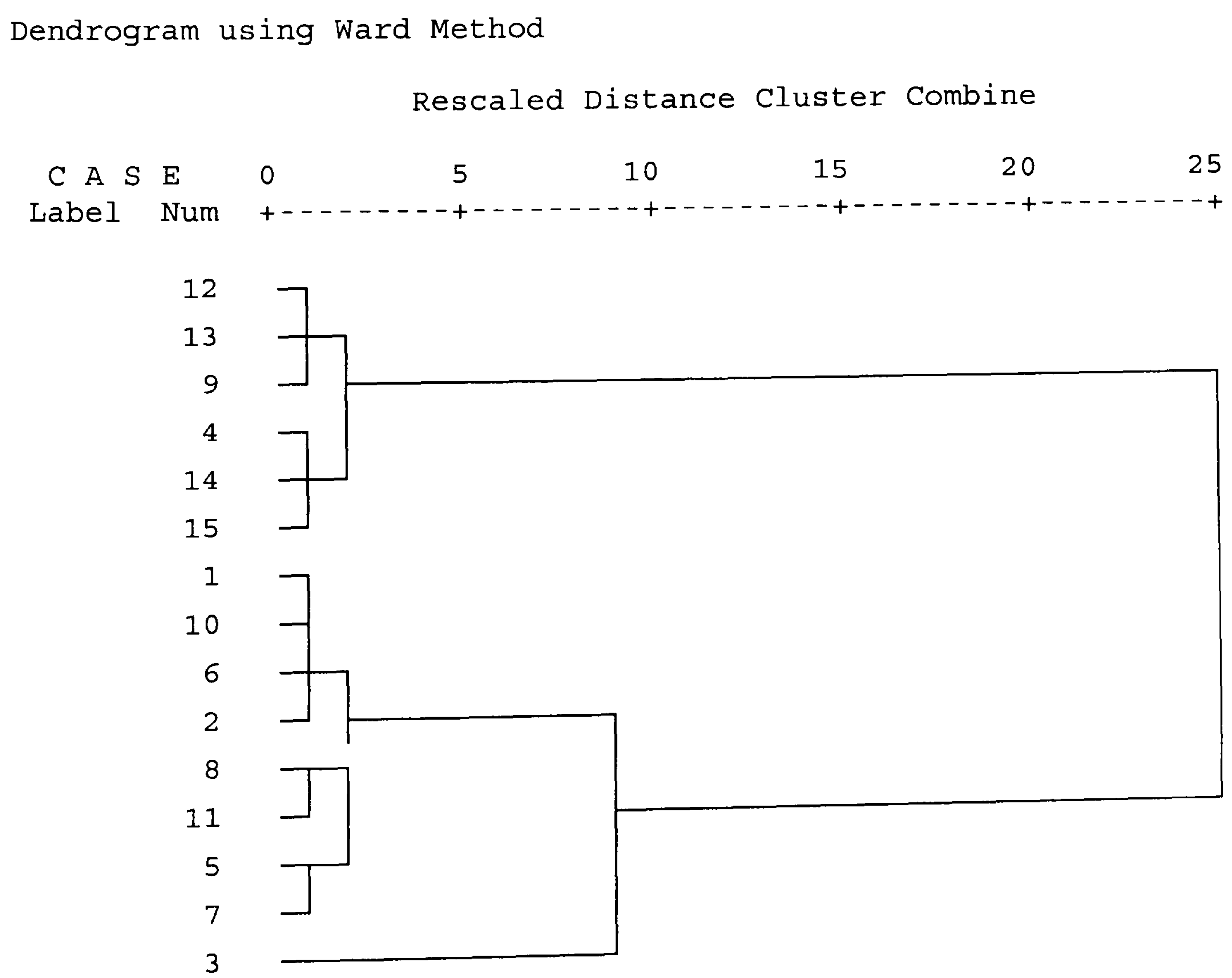
9.4. Patterns of Corporate Greening

Corporate greening is considered a complex and multi-dimensional process. Identifying the key elements in the study is not easy but from the case studies, three themes have been identified. As mentioned earlier, the cluster analysis method is used for identifying groups of strategic behaviour. The results for the cluster analysis of the fifteen companies across the three dimensions of corporate greening are shown in Figure 9.1.

Hierarchical clustering procedures were employed to determine similarities and differences among the fifteen cases in terms of their scores on the dimensions of green themes. The objective of cluster analysis was to discover which cases "hung together" in terms of dispersion of their scores on all of the dimensions considered jointly.

A clustering technique that maximises the differences between clusters and avoids the changing effects that occur with techniques like nearest neighbour was considered the best approach. Using SPSS Window version 9.0, Ward's clustering method helps to identify similar groups and offer opportunities to investigate similarities and differences among different cases and groups (Barney and Hoskisson, 1990). Below are the results of the Ward's method clustering.

Figure 9.1. Output of Corporate Greening Cluster Analysis



Four cluster of companies are identified from the dendrogram:

Group A: Company 3

Group B: Company 9, 12, 13

Group C: Company 4, 14, 15

Group D: Company 1, 2, 5, 6, 7, 8, 10, 11

The average scores for each of the four clusters are calculated across all of the three dimensions of corporate greening. This gives an indication of which dimensions are discriminating the cluster from the other clusters. These results are given in Table 9.3.

Table 9.3. Dimensional Scores for the Four Patterns of Corporate Greening Behaviour

Dimensions of Corporate Greening Behaviour				
Cluster	Company	Corporate Greening Themes		
		Top Management's Commitment	Strategic Importance of Green Issues	Operational Performance of Green Issues
A	3	2	0.65	0.45
B	9, 12, 13	2.33	1.52	5.88
C	4, 14, 15	3	1.7	5.95
D	1, 2, 5, 6, 7, 8, 10, 11	2.5	1.26	4.3

It is difficult to identify patterns of corporate greening behaviour with the numerical values for the dimensions so the numerical values were given degree of high, medium, low to make it easier to identify these patterns. The generalised patterns are listed in Table 9.4.

Table 9.4. Generalised Patterns of Corporate Greening Behaviour

Dimensions of Corporate Greening Behaviour				
Cluster	Company	Corporate Greening Themes		
		Top Management's Commitment	Strategic Importance of Green Issues	Operational Performance of Green Issues
A	3	M	VL	VL
B	9, 12, 13	M	H	H
C	4, 14, 15	H	H	H
D	1, 2, 5, 6, 7, 8, 10, 11	M	M	M

H = High, M = Moderate, L = Low, VL = Very Low

Having developed generalised patterns of each cluster, four patterns of corporate greening behaviour were identified. Similarities and differences between the cluster are particularly so that general patterns of greening behaviour can be identified and a more descriptive profile of the clusters can be developed. Following sections will describe more detail about characteristics of each cluster.

9.4.1. Cluster A

Company 3 has very low scores across strategic importance and operational performance of green issues. Only the dimension related to the top management's commitment of green issues has a medium rating. Such low scores would indicate that the company is facing some difficult challenges both within the organisation and from the outside. As Table 9.5 shows, environmental performance was poorer in 1995 and 1996. Because of this, the company has had to pay a number of fines for exceeding their effluent consent levels. There were also demonstrations by local residents protesting against the air pollution and noise which are the result of the manufacturing process. In addition, environmental groups found suspicious pipelines from the company facilities at the entry of the local riverside. Environmental groups report their findings to a local court, and investigators are sent to examine the issues.

Table 9.5. Environmental Performance Company 3

Items	1995	1996	1997	1998	1999	Average 1995-1999
Air (kg/day)	433.9	396.8	276.7	227.3	221.9	251.3
Water (m3)	8000.2	82449.6	26639.9	26792.6	21419.2	33060.3
Waste (kg/day)	4585	4811.6	5199.9	5121.8	4690.7	4881.8
Waste Recycle Rate	9.5	6.1	25.4	30.6	40.2	22.4

As Table 9.6 shows, the company has made substantial investments to achieve reductions in the air pollution levels. Environmental investment took almost half (49.1%) of total investment in 1996. Despite the company's effort to reduce environmental impacts from the business, water and waste pollution remain at relatively high levels, even if there is some reduction of air pollution.

Table 9.6. Financial Performance and Environmental Investment of Company 3

(Million Won)

Items	1995	1996	1997	1998	1999	Average 1995-1999
Turnover	193100	213328	221191	240200	201800	213923.8
Total Investment (TI)	2760	4918	3462	3385	2690	3443
Environmental Investment (EI)	896	2417	924	725	640	1120.4
EI/TI (%)	32.5	49.1	26.7	21.4	23.8	32.5

This company has mainly focused on increasing the value of the firm to shareholders. This has involved decentralisation of the strategic business units, selling shares in each component industry, carving out a major role in chemical technology, and conducting an active expansive Asian strategy including China. During this process, the company has substantially altered its internal management organisation, moving to a holding company structure in which the board operates as a portfolio manager providing strategic direction and support for the firm as a whole but giving its major business units; basic chemical, polyester, pharmaceuticals, technical polymers, and specialty chemicals; independent profit and loss responsibilities. As a result, the company manages to make progress in terms of turnover (Table 9.6).

The company is prepared to value each of its strategic business units individually and issue public shares separately. Vice president said,

"you know we tried our best, but we still have the same number of non-compliance and the severity is just as bad."

Although the company has had to make substantial investments to comply with environmental legislation, there is a definite focus only on regulation compliance. The management is trying to implement some changes but the strategic consideration and operational performance is very low and there is not much more than the management expectation of compliance. Accordingly, this cluster is labelled "Compliance".

9.4.2. Cluster B

Companies 9, 12 and 13 have high scores in strategic importance and operational performance of green issues with medium score on top management commitment. All three companies have no major waste problems and they are not dealing with products or processes that have high environmental risks. The major feature that these three companies have in common is that they are all voluntarily implementing changes in their companies that reduce their impact on the natural environment.

This group of companies maintains a good environmental performance record by reducing emissions from their facilities by investing in advanced process technology and strategically focusing their product range. At the same time, end-of-pipe environmental protection for the treatment of exhaust air and wastewater as well as waste disposal is becoming less necessary (Table 9.7, Table 9.8, and Table 9.9).

Table 9.7. Environmental Performance Company 9

Items	1995	1996	1997	1998	1999	Average 1995-1999
Air (kg/day)	43	23	18	19	15	23.6
Water (m3)	483	420.8	348.8	479.2	266	399.6
Waste (kg/day)	3878	3296	2761	2622	2932	3097.8
Waste Recycle Rate	68	71	69	64	72	68.8

Table 9.8. Environmental Performance Company 12

Items	1995	1996	1997	1998	1999	Average 1995-1999
Air (kg/day)	54	43	40.5	35.3	10.5	36.7
Water (m3)	2020	1520	2419	2490	2740	2238
Waste (kg/day)	4440	4770	4350	3930	3154	4128.8
Waste Recycle Rate	72	71	76	74	79	74.4

Table 9.9. Environmental Performance Company 13

Items	1995	1996	1997	1998	1999	Average 1995-1999
Air (kg/day)	66.6	11.4	11.4	11.6	7	21.6
Water (m3)	1414	1589	1366	1269	1309	1389.4
Waste (kg/day)	3510	3310	3920	3410	3200	3470
Waste Recycle Rate	78	76	69	72	81	75.2

All companies in this group gained both ISO 14000 and BS 7750 certification. In addition, they are participating in a responsible care programme pilot project aimed at avoiding the risks that arise from the landfilling of residues commonly produced by the chemical industry. Notably, there is severe reduction of air pollution of company 13 since 1995. Since obtaining ISO 14000 and BS7750 is voluntary-based, these companies demonstrate their commitment on green issues by being certified ISO 14000 and BS7750.

These companies have discovered that the investment in new technology can both reduce environmentally hazardous emissions as well as reduce cost through increasingly efficient production. As Table 9.10-Table 9.12 show, there are significant positive relationship between environmental performance and financial performance. For example, environmental investment has increased while turnover also increased. At the same time, environmental performance on air has been improved. Simply, environmental effectiveness and cost efficiency correlate well together.

Table 9.10. Financial Performance and Environmental Investment of Company 9

(Million Won)

Items	1995	1996	1997	1998	1999	Average 1995-1999
Turnover	486700	472000	500000	514600	498600	494380
Total Investment (TI)	28141	30087	37432	34252	12917	28565.8
Environmental Investment (EI)	2756	3500	4620	3820	1228	3184.8
EI/TI (%)	9.8	11.6	12.3	11.2	9.5	11.1

Table 9.11. Financial Performance and Environmental Investment of Company 12

(Million Won)

Items	1995	1996	1997	1998	1999	Average 1995-1999
Turnover	134100	184000	201000	252500	270000	208320
Total Investment (TI)	15000	15000	63700	13000	55000	32340
Environmental Investment (EI)	1410	1580	2560	1571	6050	2634.2
EI/TI (%)	9.4	10.5	4.0	12.1	11.0	8.1

Table 9.12. Financial Performance and Environmental Investment of Company 13

(Million Won)

Items	1995	1996	1997	1998	1999	Average 1995-1999
Turnover	189658	199451	204000	206012	233443	206512.8
Total Investment (TI)	8669	10453	21449	29702	23141	18682.8
Environmental Investment (EI)	126	587	2045	2497	2136	1478.2
EI/TI (%)	1.2	5.6	9.5	8.4	9.2	7.9

With regard to increasing cost pressures, CEO at Company 13 states,

"Historically, companies like us, have been accused of putting the financial bottom line before their wider social or environmental responsibilities and of concentrating on shareholder interests to the detriment of other stakeholder groups such as employees and customers." Therefore, the linkages between technological improvements, cost containment, and environmental effectiveness will only grow in importance.

The drivers for being environmentally conscious were primarily external in nature arising from governmental regulations and market opportunities to tap the growing demand for environmentally compatible products. Characteristics of this cluster are:

- It is desirable to make early financial investment in environmental protection and technology development.
- Top management commitment to environmental issues is critical for success.
- Decentralisation of environmental specialists in the different business units is most efficient.
- Environmental considerations should be viewed as an inseparable part of business performance. It is useful to set quantitative targets for different environmental performance measures.

Cluster B is labelled as "Eco-Efficiency".

9.4.3. Cluster C

Company 4, 14 and 15 in Cluster C show high scores in the three different areas of top management commitment, strategic importance and operational performance of green issues. These companies have very sound environmental performance records in the last 5 years. As Table 9.13-15 shows, this group of companies achieved superior environmental performance compared to companies in cluster A and B. Commonly these companies consider their reputation and corporate image very seriously. The CEO at Company 4 said, *"A weak or poor reputation can threaten goodwill, co-operation and ultimately the company's license to operate. Such a threat now faces our company. Its reputation is mixed, with some areas of important strength. But it also has negative associations which, if left unchecked, are likely to undermine the company's ability to operate smoothly and efficiently - in other words, its ability to serve its stakeholders and, in particular, its shareholders."*

Table 9.13. Environmental Performance Company 4

Items	1995	1996	1997	1998	1999	Average 1995-1999
Air (kg/day)	25	11.4	9.8	5.7	4.9	11.4
Water (m3)	693	541	494	452	421	520.2
Waste (kg/day)	157.6	241.3	234.7	186.4	167.1	197.4
Waste Recycle Rate	88	83	86	85	89	86.2

Table 9.14. Environmental Performance Company 14

Items	1995	1996	1997	1998	1999	Average 1995-1999
Air (kg/day)	35	34.8	37.4	29.4	29.1	33.1
Water (m3)	800.2	774.3	481.5	481.4	457.1	598.9
Waste (kg/day)	458	406	347	292	275	355.6
Waste Recycle Rate	95	91	88	92	93	91.8

Table 9.15. Environmental Performance Company 15

Items	1995	1996	1997	1998	1999	Average 1995-1999
Air (kg/day)	26.2	20.2	18.9	18.4	16.8	20.1
Water (m3)	612.9	612.6	575.1	326.5	321.4	489.7
Waste (kg/day)	111	151	100	93	79	106.8
Waste Recycle Rate	74	72	81	80	81	77.6

With regard to stakeholder involvement, these companies demonstrate their commitment on public relations and local community. For example, CEO at company 14 states,

"The extent to which a community itself can be considered as an asset depends upon stocks of social capital, identified as: the networks, norms and trusts that facilitate co-ordination and co-operation for mutual benefit."

However, CEO at company 15 admitted the social aspects of business activities are generally not well understood in the business.

"We are a technological company and a lot of work in awareness buildings has to be done. The economic side is well understood, although it's not often expressed in ways that reflect its contribution to society."

All these companies are aware of green issues and regard these issues as business opportunities rather than threats. Thus, with top management's support, these companies have a proactive strategy in environmental investment and technology development. The CEO at company 14 said,

"There is growing awareness that addressing green concerns does not depend on a tremendous investment but more on a proactive approach, managerial ability and commitment tied to smart investment."

The initial cost of incorporating green concerns is indeed an investment rather than an expense. It is an investment that has significant impact on the overall business. Those companies with the skills to manage these issues do so at a fraction of the cost, and far more effectively than those without an integrating approach. These outcomes can be found in Table 9.16-Table 9.18. As Table 9.16-Table 9.18 show, the companies manage to keep certain level of environmental investment each year while showing very good environmental performance.

Table 9.16. Financial Performance and Environmental Investment of Company 4

(Million Won)

Items	1995	1996	1997	1998	1999	Average 1995-1999
Turnover	444800	480000	460700	528600	586300	500080
Total Investment (TI)	45300	43500	39100	42900	46200	43400
Environmental Investment (EI)	1735	2696	1865	1870	1848	2002.8
EI/TI (%)	3.8	6.2	4.8	4.4	4.0	4.6

Table 9.17. Financial Performance and Environmental Investment of Company 14

(Million Won)

Items	1995	1996	1997	1998	1999	Average 1995-1999
Turnover	185330	244110	279260	331700	348120	277704
Total Investment (TI)	18141	14350	16370	23071	20087	18403.8
Environmental Investment (EI)	865	852	917	783	757	834.8
EI/TI (%)	4.8	5.9	5.6	3.4	3.8	4.5

Table 9.18. Financial Performance and Environmental Investment of Company 15

(Million Won)

Items	1995	1996	1997	1998	1999	Average 1995-1999
Turnover	287089	297430	306085	314760	342686	309610
Total Investment (TI)	27310	26470	29782	30162	32547	29254.2
Environmental Investment (EI)	740	835	876	890	912	850.6
EI/TI (%)	2.7	3.2	2.9	2.9	2.8	2.9

These companies have their own environmental programmes which are cost-effective since their absence might generate deep, irreversible and much more costly problems of competitiveness, given the uncertainty that pervades the industry. These consequences reflect themselves in these companies' reputation, a major source of continued market superiority. CEO at Company 15 states,

"Commercial enterprises don't exist just to raise operational standards. However, some see their purpose purely in terms of increasing shareholder value. This is essential, but too narrow. In our company, we see our wider purpose as helping people to build a better world. This is reflected in our commitment to sustainable development. We must, of course, do so profitably in order to fund investment for the future and create wealth for society – including making a proper return to our shareholders."

Similarly, CEO at Company 14 gave a proactive view of going green. According to him, *"Sound science and regulatory compliance are not sufficient to secure public support for decisions or to guarantee a company's long-term licence to operate. Thus, reputation is likely to be positive where expectations are met and negative where behaviour falls short of expectations."*

Clearer indication of the attitude of this group of companies can be found in the statement which CEO at Company 14 made. According to him,

"With this emphasis on financial performance, does this mean that we are abandoning the efforts that we have been putting in to improve our environmental and social performance? The answer is very firmly no, because while it is clear that if we do not improve our financial performance all our efforts in the environmental and social field will be in vain, it is also true that our business cannot be sustained on the basis of good financial performance alone. If we are to be a top performer, we have to fix our overall financial performance urgently, but for a really sustainable business we have to make sure that the other two legs of the stool are in good shape also."

All companies in this cluster have ISO 14001 certification and quantified environmental performance targets.

There are four important drivers leading to an emphasis on environmental issues. These are governmental regulations, increasing public awareness of environmental issues, corporate image and reputation, demands from customers, and the media.

To develop a positive environment-oriented reputation and compliance with government regulations, companies have committed themselves to the *Responsible Care* programme, which was discussed in chapter 5.

This group of companies believes in a "cradle to grave" philosophy for environmental management that spans the entire production chain. For example, a solvent like acetone is shipped from suppliers in rail, cars or trucks. Being part of the association implies that all relevant local sites and facilities including suppliers must follow the *Responsible Care* guidelines.

This group of companies are encouraged to subscribe to the *Responsible Care* programme because any potential liabilities arising out of the producer's operations may render the buyer also liable.

Environmental performance management, environmental information management, incorporation of environmental issues in the new product development process are the three major environmental practices in this group. Increasing eco-productivity and products are due to heavy investments in research and development.

Companies in this group identified specified targets in following activities:

- Use of life cycle assessment (LCA)
- Environmental management
- Environmental compliance
- Consumption of raw materials, water and energy
- Packaging materials
- Distribution
- Environmental communication and training

The following characteristics of Cluster C companies can be summarised:

- A proactive approach to environmental management, as can be seen from the setting of specific targets for future environmental performance for outcomes, inputs and processes, is critical for success.

- An open approach to communicating environmental information to the general public is desirable.
- The reliance on objective measures for monitoring, controlling, and reengineering environmental operations is also critical to recognise.

Cluster C is labelled as "Sustainable Development".

9.4.4. Cluster D

Company 1, 2, 5, 6, 7, 8, 10 and 11 show medium level of top management's commitment, strategic importance and operational performance of green issues. All eight companies have been focusing on reducing their operating costs and have not focused on environmental issues more than is required by the regulations. Very few cost reduction initiatives were implemented because they would primarily reduce the environmental impact of the company. Any environmental improvement from the cost reduction initiatives would be a secondary outcome. As Table 9.19-Table 9.26 show, there is no clear sign of severe reduction in levels of pollution or waste even if there is a general improvement in environmental performance.

Table 9.19. Environmental Performance Company 1

Items	1995	1996	1997	1998	1999	Average 1995-1999
Air (kg/day)	125	120	130.6	130	100	121.6
Water (m3)	267	116	99	109	80	134.2
Waste (kg/day)	800	850	770	715	672	761.36
Waste Recycle Rate	65	53	51	55	65	57.8

Table 9.20. Environmental Performance Company 2

Items	1995	1996	1997	1998	1999	Average 1995-1999
Air (kg/day)	120	165	140	130	90	129
Water (m3)	4129	4505	4789	5175	4184	4556.4
Waste (kg/day)	4236	4746	4563	4420	4903	4573.6
Waste Recycle Rate	36	41	38	40	42	39.4

Table 9.21. Environmental Performance Company 5

Items	1995	1996	1997	1998	1999	Average 1995-1999
Air (kg/day)	133.9	98	54	47	21	70.8
Water (m3)	5137	5540	5905	3931	1835	4469.6
Waste (kg/day)	1631	1750	1691	1657	1594	1664.6
Waste Recycle Rate	24	27	34	29	31	29

Table 9.22. Environmental Performance Company 6

Items	1995	1996	1997	1998	1999	Average 1995-1999
Air (kg/day)	185	137	119	119	93	130.6
Water (m3)	1786	1340	1419	1362	1043	1390
Waste (kg/day)	1733	1571	1690	1350	1167	1502.2
Waste Recycle Rate	43	47	40	39	45	42.8

Table 9.23. Environmental Performance Company 7

Items	1995	1996	1997	1998	1999	Average 1995-1999
Air (kg/day)	68.6	41.6	39.9	37.8	35.7	44.7
Water (m3)	4934	4970	4729	4481	4127	4648.2
Waste (kg/day)	7572	9505	8984	8970	8400	8686.2
Waste Recycle Rate	47	39	38	36	39	39.8

Table 9.24. Environmental Performance Company 8

Items	1995	1996	1997	1998	1999	Average 1995-1999
Air (kg/day)	110	76	79	71	59	79
Water (m3)	1139	1068	1096	2200	2360	1572.6
Waste (kg/day)	602.3	530.4	434.8	542	546	531.1
Waste Recycle Rate	34	32	30	33	38	33.4

Table 9.25. Environmental Performance Company 10

Items	1995	1996	1997	1998	1999	Average 1995-1999
Air (kg/day)	81.4	90.9	73.7	40.3	40.1	65.3
Water (m3)	129.2	946.52	731.23	665.69	569.72	608.5
Waste (kg/day)	130	138.7	116.2	113.3	112.4	122.1
Waste Recycle Rate	32	22	27	33	31	29

Table 9.26. Environmental Performance Company 11

Items	1995	1996	1997	1998	1999	Average 1995-1999
Air (kg/day)	82.2	57.6	56.6	26.4	17.8	48.12
Water (m3)	7767	4981	4599	4006	4129	5096.4
Waste (kg/day)	947	848	799	740	730	812.8
Waste Recycle Rate	24	32	26	34	32	29.6

For example, company 8 is primarily focused on complying with regulations with regards to their operations but are taking a much more aggressive approach with regards to their products. The company stays very well informed about the types of chemicals included in their products and is attempting to reformulate any product that contains chemicals that require special permits to use. For example, when chlorofluorocarbons (CFCs) were banned, the company had to find replacements for the propellants in their aerosol spray paints. This strategy helps the company to keep their compliance costs down since the company avoids using certain chemicals, thus avoiding the costs of obtaining permits and disposing of hazardous wastes. The company has not faced any major environmental problems related to their business activities. As Table 9.27-Table 9.34 show, there are clear sign of decreasing environmental investment when the South-East Asian Financial Crisis affected Korean industry in 1998 and 1999. During this period 1998-1999, most companies in this cluster seem to agree that green issue is a secondary issue when they face financial difficulty. CEO at Company 10 confirmed this. According to him, *"All other companies like us are restructuring their organisations. If we don't make it, I don't think we are able to be competitive in the market. In this situation, paying attention to green issues does matter for business survival?"*

Table 9.27. Financial Performance and Environmental Investment of Company 1

(Million Won)

Items	1995	1996	1997	1998	1999	Average 1995-1999
Turnover	157000	130000	163000	230000	274600	190920
Total Investment (TI)	28141	30087	7580	12917	7428	17230.6
Environmental Investment (EI)	217	406	655	1258	432	593.6
EI/TI (%)	0.7	1.3	8.6	9.7	5.8	3.4

Table 9.28. Financial Performance and Environmental Investment of Company 2

(Million Won)

Items	1995	1996	1997	1998	1999	Average 1995-1999
Turnover	189658	199451	204000	206012	233443	206512.8
Total Investment (TI)	8669	10453	21449	29702	6732	15401
Environmental Investment (EI)	126	587	2045	2497	414	1133.8
EI/TI (%)	1.4	5.6	9.5	8.4	6.1	7.3

Table 9.29. Financial Performance and Environmental Investment of Company 5

(Million Won)

Items	1995	1996	1997	1998	1999	Average 1995-1999
Turnover	89867	115336	111987	117586	146982	116351.6
Total Investment (TI)	2730	3500	5407	5402	2594	3926.6
Environmental Investment (EI)	457	387	534	608	464	490
EI/TI (%)	16.7	11	9.8	11.2	17.8	12.4

Table 9.30. Financial Performance and Environmental Investment of Company 6

(Million Won)

Items	1995	1996	1997	1998	1999	Average 1995-1999
Turnover	161600	238500	201800	170000	248600	204100
Total Investment (TI)	20134	26847	31250	23472	8245	21989.6
Environmental Investment (EI)	3500	3000	1600	900	430	1886
EI/TI (%)	17.3	11.1	5.1	3.8	5.2	8.5

Table 9.31. Financial Performance and Environmental Investment of Company 7

(Million Won)

Items	1995	1996	1997	1998	1999	Average 1995-1999
Turnover	148435	198700	223000	266600	279000	223147
Total Investment (TI)	12490	14360	21800	6490	5370	12102
Environmental Investment (EI)	1393	4076	2756	480	375	1816
EI/TI (%)	11.1	28.3	12.6	7.3	6.9	15

Table 9.32. Financial Performance and Environmental Investment of Company 8

(Million Won)

Items	1995	1996	1997	1998	1999	Average 1995-1999
Turnover	28223	33051	36068	46500	85000	45768.4
Total Investment (TI)	1324	2360	3740	2170	1987	2316.2
Environmental Investment (EI)	477	761	1040	320	180	555.6
EI/TI (%)	36.0	32.2	27.8	14.7	9.0	23.9

Table 9.33. Financial Performance and Environmental Investment of Company 10

(Million Won)

Items	1995	1996	1997	1998	1999	Average 1995-1999
Turnover	198435	243750	274230	342840	372360	286323
Total Investment (TI)	17930	20600	20784	20600	6910	17364.8
Environmental Investment (EI)	1820	1120	1030	470	110	910
EI/TI (%)	10.1	5.4	4.9	2.2	1.5	5.2

Table 9.34. Financial Performance and Environmental Investment of Company 11

(Million Won)

Items	1995	1996	1997	1998	1999	Average 1995-1999
Turnover	125448	116410	133443	143643	172931	138375
Total Investment (TI)	16610	12640	16790	7684	5579	11860.6
Environmental Investment (EI)	1327	1660	2470	540	510	1301.4
EI/TI (%)	7.9	13.1	14.7	7.0	9.1	10.9

The following characteristics of Cluster D have been identified as lacking

- providing ongoing education and training for employees to effectively deal with day-to-day environmental responsibilities as well as environmental emergencies.
- complying with and exceeding requirements of all applicable environment-related laws and regulations.
- adopting its own environmental quality standards in cases where existing laws and regulations are not adequate.
- communicating its commitment to environmental quality to its employees, shareholders, suppliers, customers, and local communities in which it operates.
- recognising and respond to the community's questions about its operations.
- actively participating with government agencies and other appropriate groups to ensure that the development and implementation of environmental policies, laws, regulations, and practices serve the public interest and are based on sound scientific judgement.
- regularly assessing and report to management and the board of directors on the status of its compliance with this policy and with environmental laws and regulations.

Cluster D is labelled as "Beyond Compliance".

Based on the analysis of four different clusters, following corporate greening model is produced as shown Table 9.35.

Table 9.35. Corporate Greening Response Model

Label	Compliance	Beyond Compliance	Eco-Efficiency	Sustainable Development
Type	Reactive	Anticipatory	Proactive	High Integration
Cluster	A	D	B	C
Company	3	1, 2, 5, 6, 7, 8, 10, 11	9, 12, 13	4, 14, 15
Character-istics	Regulatory Standards - Compliance of regulation	Cost Avoidance - Impact reduction - Pre-emption of regulation - Partnerships	Profit-Seeking Approach - Eco-efficiency - Strategic environmental management - Leadership - Competitive Edge	Explicit mainstreaming of environmental goals - Environmental cost management - Resource-productivity - Products of service

In addition, ten corporate environmental management themes are identified during the analysis of four different clusters. This can give extra information for corporate environmental management (Table 9.36). As Table 9.36 shows, all companies involve the issue of recyclability and reuse. In addition, most companies adapt waste management and compliance with environmental regulations. Companies in "Sustainable Development" cluster have proactive environmental orientation and environmental information management system while a company in "Compliance" has no additional corporate environmental activities such as life cycle assessment and environmental performance management.

Table 9.36. Corporate Environmental Management (CEM) Themes

No.	CEM Themes	Cases														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Recyclability	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	Reuse	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3	Waste Minimisation	X	X		X			X	X	X	X	X	X	X	X	X
4	Proactive Environmental Orientation				X										X	X
5	Environmental Information Management				X										X	X
6	Life Cycle Assessment				X					X			X	X	X	X
7	Environmental Performance Management				X					X			X	X	X	X
8	Environmental Risk Assessment				X					X			X	X	X	X
9	Compliance with Environmental Regulations		X		X	X	X	X	X	X	X	X	X	X	X	X
10	Environmental Eco-Audit				X					X			X	X	X	X

Relevant environmental issues in each company are marked with an "X".

9.5. Conclusion

This chapter has presented the findings from the analysis of the multiple case studies. Since the main objectives of employing the case study method was to explain and illustrate the qualitative findings in more detail, identifying key themes and rating those themes were performed. Based on the rated score, cluster analysis provided graphical illustration of four different groups of companies. These are labelled as compliance, beyond compliance, eco-efficiency and sustainable development. Compliance indicates a minimum level of corporate greening while sustainable development refers to maximum level of corporate greening in given cases. Only one company is labelled in compliance while the majority of companies are positioned beyond compliance. Some companies are situated in eco-efficiency and sustainable development. Based on the findings from the case study, following conclusions can be drawn.

First, few companies are positioned in "reactive" type of corporate environmental management. The common characteristic from reactive companies is that top executives view "green" issues as a serious regulatory burden or threat. Thus, companies in "Compliance" category try to meet the minimum level of regulatory legislation.

Second, the majority of Korean chemical companies are situated in "Beyond Compliance". Since the characteristic of this category is complying with legislation while avoiding extra cost, many companies do still pay attention to regulations rather than identify new business or market opportunities. In this case, top executives don't consider green issues as new opportunities. Rather, they think of these issues as extra costs.

Third, some leading companies are positioned in "Eco-Efficiency" or "Sustainable Development". The main characteristics of these companies are looking for new business opportunities through corporate environmental management. In other words, achieving leadership and competitive edge in corporate greening will bring better performance in environmental and financial performance. In addition, continuous commitment and improvement is another main characteristic in these two groups. The main difference between two groups is dependent upon explicit environmental goals as a main business goal. "Eco-Efficiency" group has rather business-oriented goal while "Sustainable Development" group has more balanced goal of environmental and financial goals.

Chapter 10 will bring all findings from the survey, the interview and case study together for discussion.

Chapter Ten

Discussion

10.1. Introduction

The objectives of this chapter are twofold. First, it discusses the findings gained from the questionnaire survey, the interviews and the case studies, as tabulated earlier in Chapters 7, 8 and 9. This will help to determine the extent of top management commitment and its influence on the corporate greening process. To facilitate this, we need to (i) examine the factors which the respondents said they have adopted; and (ii) analyse the reasons why the respondents have implemented the corporate greening process. Second, it provides more detailed discussion on whether or not the top management commitment has been effective in encouraging corporate environmental management in the Korean chemical industry.

10.2. Two Different Views on Sustainable Development: Techno-centric and Eco-centric Perspective

This research began with discussion on the concept of sustainable development in the business community. With regards to this concept, the view which decision makers, especially top managers, take is influenced by values and beliefs which they have. The collective values and beliefs of an organisation's top managers about its distinctive attributes are known as the organisation's paradigm. The content of the paradigm affects how issues are interpreted and acted upon within the organisation (Dutton, 1993).

In Western society, business leaders have accepted the paradigm in pursuit of economic growth, technological development, increasing efficiency and mass production and consumption as a vehicle for progress (Gladwin *et al.*, 1995). This "techno-centric" paradigm has been dominant in business organisations and is evidenced in wasteful use of resources, over-dependence on technology for environmental problems solving (Shrivastava, 1995).

Recently, however, business leaders have become aware of environmental damage attributable to our human society. A small but steadily growing number of stakeholders are paying more attention to consumerism and finding desirable the tenets of restricting growth, protecting ecosystems, and ultimately securing a more harmonious relationship between humans and nature (Hawken *et al.*, 1999). This "eco-centric" paradigm has become important to the changing relationship between business and the natural environment. Some organisations responded to these "green" challenges from external factors such as regulations, competitions or stakeholders, and changed the way in which they view and interact with the natural environment.

Understanding the top managers or executives views on sustainable development is one of the main objectives in this research. The case study found that some business organisations are placing greater value on the natural environment than others (Gladwin *et al.*, 1995; Shrivastava, 1995; Hawken *et al.*, 1999). Recognising the environment as a source of competitive advantage conveys moderately strong pro-environmental attitudes among top management. Thus, business organisations vary according to how strongly they embrace "green" values and beliefs in the evolving environmental paradigm. As Dutton (1993) points out, top managers' perceptions or views affect how issues are interpreted and acted upon within the organisation (Dutton, 1993). Based on the findings from this study, following sections will discuss more detail why and how top managers take different corporate environmental strategies.

10.3. Green Environment as A part of Organisational Environment

This research began by attempting to redefine organisational environment which includes the green environment. Since conventional organisational environment in strategic management does not include "green" environment, "green" environment at large is ignored in the study of strategic management and corporate environmental strategy. Thus, this study attempts to include "green" environment in organisational environment in formulating corporate environmental strategy. In this study, corporate environmental strategy refers to "a pattern in action over time intended to manage the interface between business and the natural environment" (Sharma, 2000, p.682). There have been two extreme polar strategies, i.e. regulatory compliance and voluntary proactive responses. Previous corporate environmental strategies can be described by stage models ranging from reactive to proactive. For example, "resisting" in Logsdon's (1985) work is very close to compliance-based reactive, "proactivist" in Hunt and Auster's (1990) work is similar to "innovation" in Post and Altman's (1992) study. In general, reactive strategies involve "end-of-pipe" approach which does not require the firm to develop expertise or skills in managing new environmental technologies or processes (Russo and Fouts, 1997, p.538).

On the other hand, a proactive strategy requires the acquisition and installation of new technologies that may lead to the development of competitively valuable organisational capabilities (Sharma and Vredenburg, 1998). Similarly, Sharma (2000) classified corporate environmental strategy as the continuum of conformance to voluntary. According to her, a conformance strategy involves complying with regulations and adopting industry standards that would be the results of pressures from government regulators, competitor actions, industry stakeholders. She also describes a voluntary environmental strategy as a consistent pattern of company action taken to reduce the environmental impact of its operations. In her discussion, she argues that "actions would be the product of a wide range of organisational and managerial choice" (p.683).

In corporate environmental strategy, the concept of "strategic choice" has been influential (Kald *et al.*, 2000; Sharma, 2000). Taking reactive or proactive corporate environmental strategies involves problem solving, the search for information and collaborative interactions with stakeholders, with implication of the central role of managerial interpretations in adopting corporate environmental strategies. In this research, "strategic choice" approach based upon Miles and Snow's (1978) work is employed to examine executives' managerial interpretation of green environmental uncertainty. According to Miles and Snow (1978), it is possible to distinguish groups of companies within each group that deal with the external environment in a relatively similar fashion. The respective groups may be designated as defenders, prospectors, analysers and reactors. In the studies on strategic management, the typologies of defender and prospector have been the principal ones used. Because the analyser is a hybrid mixture of defender and prospector, it is not easy to distinguish from other typologies. Also, reactors had to be simply excluded because these have no real strategy, they will not be successful in the longer run. The prospector is the most dynamic of the organisational forms which Miles and Snow (1978) described. This type of organisation operates in an environment characterised by rapid and unpredictable changes. Prospectors adapt to this turbulent environment by using high levels of environmental scanning (Daft and Weick, 1984) to identify opportunities for developing the new products or markets that are critical to their success. The defender is a less dynamic form of organisation operating in an environment that is more stable and predictable than that of the prospector. This more stable environment allows defenders to engage in less environmental scanning and more long-range forecasting and planning than do prospectors. The defender's success is a focus on efficiency. Defenders compete by producing low-cost goods or services and obtain efficiency by relying on routine technologies and economies of scale gained from largeness. Miles and Snow (1978) describe the analyser as "unique combination of the prospector and defender types" (p.68). Analysers adopt some characteristics of prospectors and some characteristics of defenders, seeking effectiveness through both efficiency and new products or markets. The reactor is characterised as an unstable type that lacks a consistent, clearly articulated strategy. The original Miles and Snow's study referring to the four types was theoretical in nature, and the groups were really "ideal types". But empirical studies have failed to find this level of differences and have mostly been able to detect any two or three types (Hendry and Pettigrew, 1992; Nilsson and Rapp, 2000).

This research found four strategic types from case studies. Miles and Snow's prospector can be placed on the "Sustainable Development" type. With high level of top management commitment, companies in sustainable development type seek opportunities which can achieve higher financial and environmental performance. These companies carried out frequent environmental analysis and scanning to identify new opportunities for developing the green products, markets and consumers. Defenders in Miles and Snow can also be posited at companies in the "Beyond Compliance" type. These companies avoid extra regulatory burden and costs, and minimise risks which caused from the green environment. Miles and Snow's analysers can be companies in the "Eco-Efficiency". Companies in this category show combined strategic characteristics of the prospector and defender types. That is, companies take proactive strategy when new green products and market opportunities are likely to be profits in the short term. So companies in eco-efficiency can be middle-ground types between prospectors and defenders. Companies in the "Compliance" can be reactors in Miles and Snow. As Miles and Snow described, managers in reactors' strategic type perceive environmental change and uncertainty but are unable to respond effectively. Similar characteristics are found in the "Compliance". The company in compliance simply hasn't produced a consistent strategy in corporate environmental management, and acted when the environment forces them to do so.

The Miles and Snow's classification started from the opportunities for strategic choice open to organisations. As Child (1972) claimed, the strategies of the organisations are not predetermined by the business environment. Miles and Snow (1978) developed Child's (1972) point further. That is, "organisations create their own environment by choosing the domain or competitive arena on which their markets, products, technology and ultimately their strategy are based" (Kald *et al.*, 2000, p.203). Miles and Snow (1978) also noted that strategic choice is sometimes constrained and that organisations may have limited ability to control their context. As a result, organisations may not be free to adopt any one of the typologies identified by Miles and Snow (1978). Instead, the contingencies facing an organisation may determine the form it must adopt to be effective. Thus, the number of forms that an organisation can adopt is limited to the number of types identified in Miles and Snow's (1978) work and constrained further by the presence of contingency factors (Doty *et al.*, 1993).

In order to understand how corporate environmental strategy is formulated based on executives' attitude and perception of green issues, in this research, executives' green environmental uncertainty is tested. As mentioned earlier, green environmental uncertainty here is defined as a decision maker's perceived inability to predict accurately what the green attributes related outcomes of a decision might be. Also, the question of how does executives' green environmental uncertainty be related to strategic management issues is tested. As discussed in Chapter 7, the survey results found that executives' green environmental uncertainty in government environmental policy, green competition and green technology has a positive link with strategic management issues including top management commitment, green analysis and scanning. Yet, executives' green environmental uncertainty in environmental resources and services, green products, markets and demand, and green stakeholders has no positive link with strategic management issues. Therefore, the survey results confirm that decision makers selectively perceive and create their own contexts by their strategic choice. This study supports the view of Child (1972), and Miles and Snow (1978). That is, the survey results found that executives' perception and interpretation of green environment has positive influence to strategic management issues.

10.4. Top Management Involvement and Green Issues

In order to investigate this issue, it is necessary to take a step back in our discussion to remind us why top management commitment is a matter of importance in the first place. As highlighted in this study, top executives selectively perceive environmental influences on their organisational environments. Also, the perceived environment influenced executives' choices in decision-making situations. The Korean industry is not an exception. In Korea, the leadership or ownership has strong influenced to strategic direction by the informal *Chaebol*[13] Korean corporate culture. Top executives' involvement in strategic decisions has been crucial for successful implementation. With regard to green issues, their involvement is vital because executives will ultimately sign up to implement activities in corporate greening at the final stage of the board meeting.

With regard to green issues, top executives' involvement can be reflected as environmental commitment. As Ghobadian *et al.* (1998) have suggested earlier in Chapter 3, there are three different levels of environmental commitment. These include restrained, speculative and conditional commitment. Restrained commitment indicates engagement in only last minute "window dressing". In Hoffman's (1997) term, greenwashing has a similar meaning to restrained commitment. According to Hoffman (1997), companies show their environmental commitment without any changes. The findings from this study confirms that most companies are placed in the "Beyond Compliance" category. Since this category has medium level of top management commitment, companies in this category want to show their environmental commitment without real change. One executive expressed his view on environmental commitment as follows:

"To reach at an adequate evaluation of the corporate strategy and plan for the future including environmental investment, it is necessary that estimates of expected environmental demands be made, along with an appraisal of the consequences they will entail, in the same way as this is done for all other elements such as sales, marketing, or an investment plan. In this way the profitability and the risk elements of the strategy and

[13] *Chaebol* refers conglomerates corporate type in Korea.

plan can be established. The uncertainty as regards future environmental standards potentially involves large financial risks and can threaten the profitability of the company."

One of senior directors of the department of environmental affairs confirmed the executive's view. According to him, *"top management wants to keep the cost aspects of new environmental investments and projects under a close watch."*
Executives in this category believe green issues will cause financial risks and threats to corporate profitability in the future.

In contrast, speculative commitment indicates companies that become environmental leaders, achieving both superior environmental and financial performance. The findings from this study confirm that some companies achieve both performances with explicit goals in environmental and economic term. In this study, three companies are positioned in the "Sustainable Development" category. With high top executives' commitment, companies in this category take proactive strategies to increase their market share, develop new business opportunities and demonstrate green corporate image or reputation. Extensive and independent environmental review activity on the part of top management was found in three cases. The chairman of the board reportedly exhibited an active interest in the environmental aspects of projects throughout the entire course of strategic planning. One of three companies in this category was motivated by the need for a better environmental control performance, the firm's board of directors had spent a great deal of time reviewing and approving the environmental projects and plans for environmental protection or corporate greening. One of the senior directors of manufacturing confirmed the formal review and approval by executives with regards to environmental projects.

According to him, *"I reviewed each and every part of the project on environmental performance grounds and had to be totally satisfied before I sent it up to the board for approval. Because I know they will look for me if they have doubts about the project which I sent them."*

The third environmental commitment, conditional commitment is not exactly matched with findings from this study. The reason is the conditional commitment is related to multinational companies which have foreign operating facilities. Since this study focused only on Korean chemical industry, the commitment is beyond the study boundary.

The next task was to understand executives' perception and interpretation of green environmental uncertainty. In order to do this, it is useful to categorise their perception and interpretation of the uncertainty as opportunity and threat. As mentioned earlier, the opportunity category implies a positive situation in which gain is likely while the threat category implies a negative situation in which loss is likely (Dutton and Jackson, 1987, p.80). Since proactive corporate environmental strategies involve the search for innovative technologies that add complexity to production and increase the level of risk for a company and its managers, top managers who view the unpredictability of new technologies as threats to their work or to their company's operations are likely to be averse to risk and to seek to minimise losses rather than maximise gains. These managers are unlike to take proactive corporate environmental strategies because these can disrupt current production systems. Daft and Weick (1984) studied the processes to determine the events and information that managers are aware of and those that they ignore. According to them, managers' interpretations influence organisational actions (Daft and Weick, 1984; Jackson and Dutton, 1988) and possibly the corporate environmental strategy.

Decision makers in the organisations, in particular top level decision makers face a great deal of ambiguity and uncertainty because of relatively new environmental pressures from stakeholders, and they "rely on categorisation because it reduces the complexity of the stimulus world by organising objects into meaningful groups" (Dutton and Jackson, 1987, p.78). Categories in strategic management are mostly labelled as opportunity and threat. In this research, the interview is employed to examine whether executives perceive green issues as opportunities or threats. In addition, the issue what strategic actions are taken based upon their perceived green environmental uncertainty and managerial interpretations are examined.

The findings from the interviews suggest that there are increasing levels of awareness of green issues by top managers. However, there is an obvious disagreement among the companies. That is, executives' expressions of green issues are very different from others. Executives in "environmentally leading" companies consider green issues as a new business opportunity while executives in "environmentally lagging" companies consider green issues as regulatory compliance and costly. The environmental scanning activities rely on issue classification and environmental analysis typically classifies issues as threats and opportunities (Christensen *et al.*, 1982). The study supports that the schema of classification (opportunity and threat) has a clear influence to executives' perception and their corporate environmental strategy. Sharma (1997) supports this. In the longitudinal study of the Canadian oil and gas industry, she found that proactive environmental strategies were a reflection of managerial interpretation of environmental issues as opportunities. Adopting environmental issues as opportunities allows top managers to gain benefits in terms of a positive corporate image and reputation, lower costs, higher technological efficiencies (Post and Altman, 1992; Roome, 1992; Sharma, 1997).

10.5. Reasons for Adopting Green Issues

As discussed earlier in Chapter 7, 8 and 9, there are both external and internal reasons for adopting green issues. Both external and internal reasons are strongly related to top management commitment. As the survey findings indicate in Chapter 7, top management commitment is strongly related to uncertainty in government environmental policy, environmental resources and services, competition and technology. When the question why respondents take environmental or green issues in strategic decision at there board meetings, there are clear reasons for adopting green issues. Internally green issues bring a source of competitive advantage through proactive stance of corporate environmental strategy. Externally companies need to comply with government regulations, and product and environmental liabilities. These are confirmed from the findings of this study.

Companies in the category of "Compliance" and "Beyond Compliance" are under heavy pressure from government legislation. For companies in both categories, environmental legislation is the most important factor to influence top management's commitment and strategic direction. One of CEOs said, *"we will comply with all governmental environmental laws and regulations. As a result, we are dedicated to sound environmental strategy."* According to one of the written formal statement of corporate environmental policy, *"We will be a good neighbour or good citizen. We will make environmental considerations an integral part of our decision making process."* Very few of the statements said anything about going above and beyond the law. Even one company in "Compliance" category had only fragmentary references to environmental objectives in the annual reports.

Companies in both "Eco-Efficiency" and "Sustainable Development" categories adopt a more proactive stance in corporate environmental management. One of the formal written corporate environmental statements said, *"to make improvements beyond minimum environmental quality legal requirements that result in practical benefit for the environment."* All three companies in the category of "Sustainable Development" had well publicised objectives of "leadership" in the field of corporate environmental management. One company expressed its overall objective as a *"pattern of excellence and leadership in environmental improvement."* Similarly, the policy document of one company stated, *"our firm has been and will continue to be in the forefront of efforts to reconcile industrial activities with environmental needs"* (Table 10.1).

Table 10.1. Examples of Top Management Commitment

Company	Written Formal Statement of Corporate Environmental Policy	Expressed Objective of Leadership in Environmental Field	Frequent Illustrations of Top Management Support for Environmental Policy
1	Yes	No	Yes
2	Partly	No	Partly
3	No	No	No
4	Yes	Yes	Yes
5	Yes	No	Yes
6	Partly	No	Partly
7	Partly	No	Partly
8	No	No	No
9	Yes	Partly	Yes
10	Partly	No	Partly
11	Partly	No	Partly
12	Yes	Partly	Yes
13	Yes	Yes	Yes
14	Yes	Yes	Yes
15	Yes	Yes	Yes

In many of the firms interviewed, corporate environmental policies were reinforced by frequent illustrations of top management support. The presidents of three firms in the category of "Sustainable Development" had gained reputations for being the leading ecological spokesmen of their industries. Policy documents were frequently sent out in the name of the firm's chief executive officer. This study has confirmed the proposition that the fuller a firm's commitment to environmentally responsible behaviour, as evidenced by formal written policy statements, expressions of leadership motives, and frequent illustrations of top management support, the greater will be the ecological incorporation embodied in the strategic decision. It should be noted that a firm's expressed objectives may differ from those which are actually pursued. However, it appears that a genuine commitment to environmental protection with clear signals of top management support may represent a necessary condition for concerted, environmentally oriented strategic decision or direction. Under such conditions the managers or senior managers are more likely to internalise the objectives and to plan the strategy in accord with the perceived values important to higher echelons.

10.6. Environmental Scanning and Corporate Environmental Management

Since it is confirmed that top managers selectively perceive events or issues related to the green environment, the process of gaining information through green scanning and analysis is different between companies. Environmental scanning and analysis and strategic management issues are major vehicles for adapting to external environmental change. Strategic management focuses on aligning or matching the organisation with its external environment (Ansoff, 1965; Zahra, 1987). This match is important, as it allows the firm to capitalise on opportunities in the environment, while averting threats.

Environmental scanning is the process of seeking and collecting information about events, trends, and changes external to the business to guide the company's future strategic actions (Fahey and King, 1977). Information gathered through environmental scanning is useful in the formulation of corporate objectives and in selecting competitive strategies (Hax and Majluf, 1984; Hofer and Schendel, 1978; Porter, 1980). Information acquired from environmental scanning is subsequently utilised in the strategic management process. A firm's competitive position, financial success, and even survival depends on its ability to scan, understand, and adapt to environmental conditions (Lawrence, 1981). The external environment serves as a great source of strategic information (Daft *et al.*, 1988; Duncan, 1972; Lawrence and Lorsch, 1967). Strategic decision makers collect, interpret, and utilise information from the external environment in formulation their future strategies.

However, organisations and decision makers are limited in their capabilities to collect and process information, and are bounded in their rationality in determining the results of their decisions (Cyert and March, 1963; March and Simon, 1958). Scholars in strategic management (Daft *et al.*, 1988; Ebrahimi, 1997; Sawyerr, 1993) found a similar positive relationship between frequency of environmental scanning and perceived strategic uncertainty. With relation to the relationship between environmental scanning and decision makers perceived uncertainty, Duncan (1972) and Daft *et al.* (1988) asserted that unless environmental events are perceived as important to organisational performance, executives have very little interest in scanning them. Daft *et al.* (1988) found that strategic uncertainty results in executives scanning activities in selected sectors of the environment. Daft *et al.* (1988) conclude that executives perform environmental scanning in strategically important sectors rather than attempt cover whole sectors. Daft *et al.*'

(1988) finding is supported by this study. That is, the survey results found that environmental scanning activities had a positive relationship with only three domains - government environmental policy, green competition and green technology.

The current research provides support for conclusions previously drawn from studies of executive environmental scanning. That is, it appears that unless executives consider environmental issues as important, they will not commit the resources necessary to scan or analyse the environmental sector (Daft *et al.*, 1988).

The qualitative data suggest that other features of the organisational context not measured on the survey may have affected the likelihood of reactive or proactive corporate environmental management. For example, the presence of external pressures such as regulation and industry competition was said to influence corporate environmental strategy to frame an issue as a reactive or proactive. Indeed, proactive companies labelled as sustainable development companies stated that they acted on issues not only because of their efforts, but because of external pressures such as regulation or competitive advantage.

The qualitative results showed that framing an environmental issue as a financial or new market opportunity may be one of the keys to a proactive and successful case of corporate environmental management. Also, the qualitative results reveal that the level of formality of environmental issues gives different influence to corporate environmental strategy. That is, reactive companies view environmental issues as a separate business issue from other business issues whereas proactive companies view environmental issues as any other business issue. For example, presenting an environmental issue using formal and concrete business language rather than environmental rhetoric expressions are found in proactive and successful cases. Therefore, the results support that concrete, formally presented and congruent with strategic directions issues attract support in business organisations (Dutton and Ashford, 1993). This implies that environmental issues are not fundamentally different from other types of business issues, at least in business organisations without strong eco-centric environmental paradigms. Formally incorporating an "upper echelons" perspective on green issues into business strategy also positive influence to corporate environmental management moving from reactive to proactive or *vice versa*.

10.7. Unexpected Findings During the Research on Corporate Greening

Based the findings from the survey, the interview and the case study, majority of companies categorised in "Beyond Compliance" were not expressly interested in being at the forefront of their industries. Many seemed to view environmental protection as a "reluctantly approached hurdle or operating constraint." One executive stressed that his firm had no intention of moving rapidly ahead of social expectations in this area: *"We merely attempt to use our influence with the public authorities to set reasonable standards and then live up to those standards."*

The majority of the companies had made no attempt to develop a consistent set of policies applicable to their whole operations. One of vice presidents stated, *"We respond when and where there is social concern for ecological balance."* The sentence *"We try to make sure that our operations and products are compatible with stakeholders needs and environmental, social and economic aspirations."* was stated on the policy document of one firm. It should be stressed that in few firms did we find a completely uniform or standardised global implementation of corporate policy.

So to what extent and why did many companies encounter problems or barriers to implementing corporate greening? There are two different types of barriers to corporate greening: industry and organisation barriers (Post and Altman, 1994). According to Post and Altman (1994), industry barriers reflect the special and unique features of the business activity in which the firm engages. Industry barriers include capital costs, competitive pressures, regulatory constraints, and technical information. Organisational barriers affect a firm's capacity to deal with any form of change, including environmental change. Organisational barriers include attitudes of personnel, inadequate top management commitment, poor communication and past practice.

Four different groups of companies faced different levels of industry barriers with regard to corporate greening. The company in the "Compliance" category has mainly regulatory constraints because they do not plan any additional investments. Therefore other barriers such as capital costs, competitive pressures or technical information are not present. Other three group companies in the "Beyond Compliance", "Eco-Efficiency" and "Sustainable Development" are under full industry barriers with different level. Companies in the "Beyond Compliance" category see high regulatory pressure and competitive pressures. Companies in the "Eco-Efficiency" category have high competitive pressures but relatively low capital and technology costs because of their environmental leadership. Companies in the "Sustainable Development" category companies face relatively low level of competition, capital and technology costs because of their technological and environmental leadership with strong commitment.

In corporate greening, attention was given mainly to process pollution. Strategic attention was usually focused on issues of process-related residuals discharge, with only shallow attention generally with other actions such as construction and transportation. For example, attention to pollution control in the selection of process technology was most significant when the project involved a new engineering challenge or unsolved environmental problems. In addition to being primarily focused on residuals discharge, green environmental factors were typically brought into the strategic planning process in a rather fragmentary, compartmentalised manner. Integrative and holistic environmental impact thinking was rarely found.

More importantly, top management strategic planning was a closed, non-participatory process. Strategic planning was typically secretive, exclusionist, low profile and "official channels only" in character. With few exceptions, participation of potentially affected publics was rarely solicited. Such efforts were made just prior to any formal public hearing.

Most site location ecological baseline research, for example, was only after approval had been received, preliminary construction activity had already begun, and the range of choice had been narrowed to a single favoured project design. Project design choices seemed to be principally guided by the "pool of environmental knowledge" accumulated by the companies in the study in similar prior project planning experience and in previous environmental research and remedial efforts carried out at similar existing facilities.

The process was formalised on the matter of environmental investment and expenditure. Many of companies in the study had established formal rules and procedures for considering environmental factors during strategic planning, but these related largely to pollution control expenditure considerations and late stage environmental staff office project reviews. Top management rarely reviewed the environmental aspects of a proposed project separately, but generally considered these matters, in the context of the regular capital appropriation and review procedure.

Finally, there are common challenges in the chemical industry since companies are under increasing societal and regulatory pressures to generate lower levels of chemical toxicity. Despite active application of responsible care programmes and proactive environmental sensitivity, the realities of the chemical business require the use of toxic materials. However, companies are more willing to assume a leadership position in formulation of public policy and awareness, and have formed community advisory councils. In addition, companies have taken steps to educate the public, employees and other businesses and contractors about the need for such efforts. Companies works with local schools to promote environmental and energy awareness among school children.

10.8. Conclusion

This chapter has discussed findings from the questionnaire survey, the qualitative interview and the cluster analysis of case studies. The findings reported above are generally consistent with each other. One of the research aims of this study is to investigate the influence or effectiveness of top executives' commitment in encouraging corporate greening or corporate environmental management in the Korean chemical industry. In order to analyse the research issue, Miles and Snow's (1978) approach, in which organisations create their own environment by choosing the domain or competitive area which their strategy are based, is employed. Miles and Snow's (1978) typology of strategy gives useful framework to understand how top managers' perception of the green environment influence corporate environmental management. In order to discuss Miles and Snow's (1978) work in the corporate environmental management context, the following issues are given for the discussion. (i) top management involvement and green issues, (ii) reasons for adopting green issues in strategic decisions, and (iii) environmental scanning and top management' interpretation in corporate environmental management. Based on the discussion above, following conclusions can be drawn.

First, top executives can make explicit and formal environmental commitment through their efforts to review and approve green issues at the board meeting. Top executives have direct and indirect impacts on predicting governmental environmental policy, green competition, green technology. However, top executives have little impact on predicting environmental resources and services, green products, markets and demand, and presence of green stakeholders with the exception of shareholders. This study revealed that top executives perceive selectively green environment and their choice is based upon their selective perception.

Second, the reasons why green issues are adopted in strategic decision making are mainly because of environmental regulations and the potential for competitive advantage. That is, companies face external pressures such as government regulations and environmental liabilities. Therefore companies adopt green issues for their strategic decision making to comply with environmental legislation more efficiently and effectively. Also, companies see green issues as a source of competitive advantage. Some companies, which take proactive stance of corporate environmental strategy, consider green issues as an opportunity to achieve both economic and environmental superiority.

Third, the level of environmental scanning is dependent upon top management' interpretation of corporate environmental management. That is, the survey results found that environmental scanning activities have a positive relationship with only three domains (government environmental policy, green competition and green technology) which top managers perceive strategically important. The current research provides support that top managers' interpretation on green issues as opportunities/threats through different levels of environmental scanning and analysis bring different corporate environmental strategy. If executives perceive green issues as important opportunities, they will commit themselves scan or analyse the green environmental sector. Yet, if executives don't perceive green issues as important, they will not commit necessary resources to scan or analyse the environmental sector (Daft *et al.*, 1988).

Fourth, the following problems may cause difficulties or problems during the implementation of corporate greening or corporate environmental management. These include: (i) commitment no effectively translates to a workable action plan (ii) lack of a comprehensive risk management programme, and (iii) insufficiently strong leadership below the top management ranks.

Finally, top management strategic decision making has been typically a closed and secretive process. Strategic decision was typically "official channels only" in Korean corporate *Chaebol* culture. This exclusive strategic decision process also causes problems during the corporate environmental management such as public participation.

Chapter Eleven

Conclusion and Research Implications

11.1. Introduction

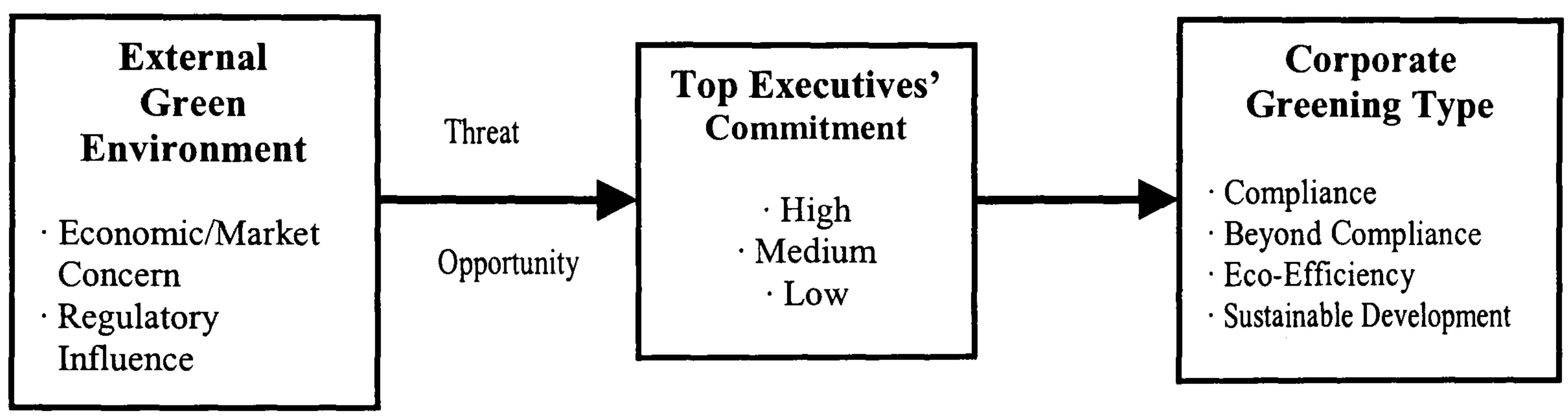
This chapter summarises the purpose of the thesis and its findings. The thesis started with research question: what are the factors which influence corporate greening behaviour? to what extent and how do business organisations transform their organisations toward corporate greening? Understanding and explaining why this is the case, has formed the central theme of this research.

This study is important because the study of natural environment has been neglected in the area of business management. Including the natural environment with organisational environment, the term "green environment" is established. Adopting green environment as a part of organisational environment, top management may perceive factors in green environment. In order to investigate this, the author has looked at how executives in the Korean chemical industry perceive uncertainty caused by the natural environment. The major findings from this research are summarised in following section 11.2. Next, the research implications and the contribution of this thesis are presented. Finally, suggestions for future research are made.

11.2. Major Findings

This study found that there are positive significant associations between top executives' perceived green environmental uncertainty caused by government environmental policy, competition and technology and strategic management issues including top management commitment, analysis and scanning. However, no significant positive relationship found between top executives' green environmental uncertainty in resources and services, products, markets and demand, and stakeholders and strategic management issues. Thus, this research confirms that decision-makers, especially top level managers *selectively* perceive green environmental uncertainty and selected perceptions influence activities in strategic management issues (Child, 1972; Miles and Snow, 1978).

Figure 11.1. Simplified Explanatory Model of Corporate Greening



As illustrated in Figure 11.1, top executives' perceptions on green environment can be divided as opportunities and threats. This dichotomy is closely related to top executives' commitment. If top executives perceive green environment as an opportunity, it is likely to take proactive strategy such as sustainable development type of corporate greening.

With regard to the reasons why executives adopt green issues in their strategic management, two factors are identified. These are regulation and the source of competitive advantage. Under different conditions such as heavy environmental pressure or regulatory pressure, executives' attitude to green issues are different. When they see a cost burden rather than a new business opportunity, they take a reactive position in corporate environmental management. If they view green issues as a new opportunity for markets and products, they take a proactive stance in corporate environmental management. Thus, this study confirmed that types of corporate greening are dependent upon executives' perception under different environmental conditions.

Additionally, this study produced four different types of corporate greening responses. These are "Compliance", "Beyond Compliance", "Eco-Efficiency", and "Sustainable Development". These different types of responses are strongly influenced by top management commitment. Different corporate greening types result in different levels of achievement in both economic and environmental performance.

11.3. The research implications and contribution of this thesis

11.3.1. Implications for Corporations and Industry

The key trends affecting the chemical industry are regulation, use of technology in protecting the natural environment, and pressures for containing costs. Regulation is a key factor affecting the industry. The current regulatory process has not kept pace with the technological advances of the chemical industry. Corporate environmental strategy should not be developed in isolation, but should be linked to corporate-level competitive priorities. Broadly speaking, firms compete on the basis of the competitive priorities of cost, quality, product innovation, another forms of differentiation such as customisation, responsiveness, and timeliness.

The majority of companies in the chemical industry are still not very "ecologically" concerned. The ecological issues are often disregarded and full consideration of environmental values is typically absent. Decision makers need to ask themselves "what impact do our decisions have on the natural environment?" This question may bring different outcomes, which are very different from the decisions taken without ecological considerations. Convincing evidence can be gathered which suggests that ecologically-oriented strategic decisions make good economic sense. Three economic reasons indicate that such behaviour can be cost-effective.

First, designing new facilities like petroleum platform and site decisions have become matters of complexity and uncertainty. A carefully and ecologically oriented design and decisions can smooth the path for expansion by helping to clear the countless social and environmental hurdles involved.

Second, ecologically oriented decisions for new projects can help to lower the potential trouble with local communities and legislation. Environmental impact assessment at an early stage of strategic planning is likely to reduce the chance of trouble by giving staff the means by which to identify, modify and mitigate the sources of trouble.

Third, an ecologically oriented strategy can help to avoid the additional costs required to rectify adverse environmental consequences after the fact. The Bophal chemical accident in India and the Valdez oil spill in Alaska proved how expensive and tragic careless and poor environmental management was. A forced closure was required in India and litigation is still going on.

11.3.2. Implications for Government

Since environmental issues cover a broad range of environmental concerns, experienced multidisciplinary and professional judgement are required. Environmental controls also include natural environmental issues as well as the impacts on the human environment. Thus, a more comprehensive and holistic view is required for governmental environmental policy. Full comprehensiveness, in the sense that all linkages and all alternatives are considered, of course will never be possible given the costs of time and information, and elements of uncertainty. Since the ability to act with full knowledge of the available alternatives and their consequences is unobtainable, government planners will need to devise methods for determining how much resource should be devoted to procuring what pieces of information and to reducing which uncertainties.

Providing market conditions favourable for investment in technology would be important for many corporations and industry. In addition, the government needs to announce the strategy for achieving the reductions in air pollution, effluents and wastes. This would give time to prepare for the implementation of corporate environmental management.

11.3.3. Contribution of this thesis

The concept of sustainable development is still an evolving idea for many academics. In particular, the study of green issues remains in its infancy. In the literature review, ten different themes of corporate environmental management were identified. The review attempted to present an overall picture of current corporate environmental management. Second, this study identifies the link between top management commitment and the implementation of corporate greening strategy, and its impact on the effectiveness of corporate environmental management. Third, two major factors, regulation and economic competitive source, are identified as reasons why executives adopt green issues in their strategic decisions. Fourth, methodologically; green environmental uncertainty questionnaire scales as a research tool is developed based on Miles and Snows' (1978) work. Fifth, methodological triangulation is proved to be very effective research methods to obtain rich data and provide fertile research outcomes.

11.4. Suggestions for Further Research

First of all, since green issues are rapidly increasing in business field, it would be worthwhile to expand the meaning of green or greening by adding more items or scales to the green environmental uncertainty questionnaire which the author developed.

Second, although the context of the Korean chemical industry may not be globally acceptable research scope or sample, it is worth testing green environmental uncertainty scales in different industries and countries. More empirical testing would bring more validity and a generalisable green environmental uncertainty research instrument.

Third, the triangulation method was tested in the Korean chemical industry. So it needs further examination to test validity and reliability in academic research. Factors, which should be in mind, are different industries, countries, and levels of staff. If further research tests the triangulation and obtain similar results, then it would be recommendable research methods for different researchers.

Fourth, There are a number of existing corporate greening response models. In this study, four categorical response models are identified and developed. More empirical and practical tests of this model may produce much more usable concepts for other researchers.

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Appendix 4.1. Corporate Greening Literature and Topics

Topic	Corporate Environmental Management Literature
Regulation and Legislation	Cordano (1993), Gouldson (1994), Hanna and Newman (1995), Hart (1997), Jaffe *et al.* (1995), King (1993), Moors *et al.* (1995), Palmer *et al.* (1995), Porter and van der Linde (1995b)
Consumer	Barry *et al.* (1993), Gouldson (1994), Hanna and Newman (1995), Stern (1994)
Marketing	Charter and Polonsky (1999), Coddington (1993), Connell (1994), Ottman (1998), Polonsky (1994), Stead and Stead (1994, 1996), Welford and Gouldson (1993)
Accounting and Reporting	Bennett and James (1998), Elkington and Hailes (1998), Gray *et al.* (1993, 1996), Schaltegger and Burritt (2000), Stern (1994)
Supply Chain Management	Bowman (1995), Hass (1996), Stead and Stead (1994), Taylor and Welford (1993), Sarkis (1995)
Stakeholder Management	Clarkson (1995), Freeman and Reed (1983), Freeman (1984), Hasnas (1998), Roberts (1992), Ullman (1985), Wicks (1996)
Management Programme (BS7750, EMAS, ISO14001)	Hillary (1998), Rothery (1993), Dowell *et al.* (2000), Zuckerman (1996)
Strategic Vision	Gladwin *et al.* (1995), Hart (1997), Shrivastava (1995, 1998), Sawyerr (1993), Steger (1993)
Threat and Opportunity	Halme (1996), Hunt and Auster (1990), Logsdon (1985), Mahon (1983), Roome (1992), Post and Altman (1992), Scallen and Sten (1997)
Performance Measurement	Bennett and James (1998), Hart and Ahuja (1994), Klassen and McLaughlin (1996), Jaffe *et al.* (1995), Lober (1994), Starik (1995), Stead and Stead (1995, 1996), Swinth and Vinton (1992), Wackernagel and Rees (1996)

Appendix 6.1. Survey Questionnaire

Business Strategy and the Natural Environment

In recent years the 'green' environment have become an important aspect of business for companies in the chemical industry. We observe that the 'green' issues are introducing new strategic choices and changing the emphases of others. As a consequence, not only individual companies but also the entire chemical industry faces new challenges in the process of integrating the 'green' environment into strategic decision making.

The aims of the research are to understand how top managers perceive the 'green' issues, how their perceptions are reflected in corporate business strategy, and to help managers in the chemical industry understand and improve this fundamental factors of strategic management. An important aspect of the research is the focus on the chemical industry as well as the individual corporations and companies.

Your organisation has kindly agreed to take part in a research project being conducted by Stirling Graduate School of Management. You will be asked questions relating to how you perceive 'green' environment and how you make strategic decisions.

The questionnaire requires you to indicate your opinion in response to a number of questions or statements. We are seeking your initial response and first impressions, not a researched answer. There are no correct answers. We want to record what you believe to be the case with respect to your organisation. All that your have to do is to circle the appropriate number. If you make a mistake, just cross through the error and ring the number which reflects your opinion.

Each individual response will be treated in strict confidence. Confidentiality also applies to the personal details at the beginning of the questionnaire.

Thank you very much for your time and co-operation in taking part in this research.

Ki-Hoon Lee
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Dept. of Management & Organization
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Stirling, FK9 4LA
United Kingdom

SECTION 1. BACKGROUND INFORMATION

Please state or tick ( ) to relevant issues or items which are the closest in your opinion.

Name and address of your organisation			
Business Area			
Number of employees in your organisation	❑ Less than 50 ❑ 2,500 – 9,999	❑ 50 – 249 ❑ 10,000 – 49,999	❑ 250 – 2499 ❑ More than 50, 000
Annual turnover for the latest financial year (million $)	❑ Less than 1m ❑ 101m – 250m	❑ 1m – 5m ❑ 251m – 1000m	❑ 6m – 100m ❑ More than 1000m
Position	❑ Chairman ❑ Senior Manager	❑ Chief Executive ❑ Others: please specify	❑ Director
Age in years	❑ Below 40 ❑ 51 55	❑ 41 45 ❑ Above 55	❑ 46 – 50
Number of years in your organisation	❑ Less than 10 ❑ 21 – 25	❑ 11 15 ❑ More than 25	❑ 16 – 20

SECTION 2. "GREEN" ENVIRONMENT AND YOUR ORGANISATION

Please indicate if factors below are predictable or unpredictable. Simply circle the numbers which match your opinion.

Government Environmental Policy (GEP)	Predictable						Unpredictable
Environmental pricing policies (GEP1)	1	2	3	4	5	6	7
Environmental tax policies (GEP2)	1	2	3	4	5	6	7
Environmental regulations affecting the business sector (GEP3)	1	2	3	4	5	6	7
Enforcement of existing environmental laws (GEP4)	1	2	3	4	5	6	7

Environmental Resources and Services from your organisation (ERS)	Predictable						Unpredictable
Availability of trained environmental staff (ERS1)	1	2	3	4	5	6	7
Environmental impact of inputs (ERS2)	1	2	3	4	5	6	7
Environmental impact of outputs (ERS3)	1	2	3	4	5	6	7
Availability of disposal services for waste, effluent and emissions (ERS4)	1	2	3	4	5	6	7
Availability of natural resources (ERS5)	1	2	3	4	5	6	7

Green products, markets and demand (GPMD)	Predictable						Unpredictable
Customer green preferences (GPMD1)	1	2	3	4	5	6	7
Green product demand (GPMD2)	1	2	3	4	5	6	7
Availability of substitute green products (GPMD3)	1	2	3	4	5	6	7
Availability of complementary green products (GPMD4)	1	2	3	4	5	6	7

Green competition (GC)	Predictable						Unpredictable
Changes in competitors' prices of green products/services (GC1)	1	2	3	4	5	6	7
Changes in the green markets served by competitors (GC2)	1	2	3	4	5	6	7
Changes in the competitors' green strategies (GC3)	1	2	3	4	5	6	7
Entry of new firms into the green market (GC4)	1	2	3	4	5	6	7
Domestic competitors (GC5)	1	2	3	4	5	6	7
Foreign competitors (GC6)	1	2	3	4	5	6	7

Green Technology in your industry (GT)	Predictable						Unpredictable
Changes in product green attributes (GT1)	1	2	3	4	5	6	7
Changes in design with green attributes (GT2)	1	2	3	4	5	6	7
New product introductions with green attributes (GT3)	1	2	3	4	5	6	7
Changes in the production process with green attributes (GT4)	1	2	3	4	5	6	7

Green stakeholders in your organisation (GS)	Predictable						Unpredictable
Shareholders (GS1)	1	2	3	4	5	6	7
Banks, Financial Institutes (GS2)	1	2	3	4	5	6	7
Regulators (GS3)	1	2	3	4	5	6	7
Employees (GS4)	1	2	3	4	5	6	7
Trade unions (GS5)	1	2	3	4	5	6	7
Media (GS6)	1	2	3	4	5	6	7
NGOs (GS7)	1	2	3	4	5	6	7
Consumers (GS8)	1	2	3	4	5	6	7
Suppliers (GS9)	1	2	3	4	5	6	7
Community (GS10)	1	2	3	4	5	6	7

SECTION 3. STRATEGIC ENVIRONMENTAL DECISIONS

In your company, (Top Management Commitment)	Extremely rare						Extremely frequent
Corporate vision are discussed linked to green corporate strategy (SED1)	1	2	3	4	5	6	7
Executives or executive team announce their vision with environmental concern (SED2)	1	2	3	4	5	6	7
Commitment and progress of environmental strategy in core business (SED3)	1	2	3	4	5	6	7

In your company, (Green Analysis)	Extremely rare						Extremely frequent
The evaluation tool such as life cycle assessment or environmental impact assessment are used to make major environmental decisions. (SED4)	1	2	3	4	5	6	7
There are formal search for, and evaluation of, environmentally focused opportunities for products new investments and new markets. (SED5)	1	2	3	4	5	6	7
In-house environmental professionals involved in investigating and preparing reports on strategic decision. (SED6)	1	2	3	4	5	6	7
External environmental professionals involved in investigating and assisting for strategic decision. (SED7)	1	2	3	4	5	6	7

In your company, (Green Scanning)	Extremely rare						Extremely frequent
There is an active dialogue with environmental stakeholders. (SED8)	1	2	3	4	5	6	7
There is an active monitoring of environmental issues. (SED9)	1	2	3	4	5	6	7
There is a routine monitoring of environmental legislation. (SED10)	1	2	3	4	5	6	7
There is an annual environmental report. (SED11)	1	2	3	4	5	6	7
There is an annual social report. (SED12)	1	2	3	4	5	6	7
There is the third party's monitoring and auditing. (SED13)	1	2	3	4	5	6	7

We welcome any comments or suggestions that might contribute to a better understanding of environmental issues and other relevant issues specific to your company and/or industry.

If you would like to receive the summary of this questionnaire findings, please tick ( ) yes, and leave your name and contact telephone number.

YES ❑ NO ❑ Name: ______________________

Telephone Number: ______________________

Please return the completed questionnaire in the envelope provided to:

Ki-Hoon Lee
Doctoral Research Member
Dept. of Management & Organization
The Faculty of Management
University of Stirling
Stirling, FK9 4LA
United Kingdom

Thank you once again for taking the time to fill out the questionnaire.

Appendix 6.2. Reliability Analysis Scale and Cronbach's Alpha

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
GEP1	73.6000	345.8222	.7724	.9423
GEP2	73.6000	339.3778	.7105	.9426
GEP3	73.4000	352.2667	.3494	.9475
GEP4	73.7000	334.6778	.7803	.9418
ERS1	73.6000	358.2667	.6014	.9442
ERS2	74.1000	351.8778	.8188	.9427
ERS3	73.9000	343.2111	.8966	.9414
ERS4	73.7000	351.3444	.7656	.9428
ERS5	72.9000	378.1000	-.1944	.9492
GPMD1	73.5000	346.5000	.8447	.9420
GPMD2	73.2000	349.5111	.4642	.9455
GPMD3	73.6000	334.4889	.7651	.9420
GPMD4	73.0000	341.1111	.6705	.9431
GC1	73.2000	353.9556	.9698	.9427
GC2	73.1000	353.2111	.5316	.9444
GC3	73.3000	356.2333	.6119	.9439
GC4	73.5000	364.0556	.4762	.9451
GC5	73.6000	352.9333	.6583	.9435
GC6	73.6000	343.3778	.8470	.9417
GT1	73.4000	335.6000	.9219	.9405
GT2	72.7000	339.3444	.6764	.9431
GT3	72.7000	339.1222	.8076	.9417
GT4	73.3000	341.1222	.8636	.9414
GS1	73.6000	351.3778	.5326	.9444
GS2	73.0000	340.6667	.8219	.9416
GS3	74.8000	373.0667	.0000	.9465
GS4	73.0000	346.8889	.7401	.9426
GS5	72.7000	342.6778	.7161	.9426
GS6	74.7000	376.6778	-.3023	.9476
GS7	74.3000	378.6778	-.2871	.9486
GS8	74.2000	363.7333	.1994	.9476
GS9	72.5000	350.0556	.3716	.9475
GS10	74.6000	366.7111	.2459	.9462

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients

N of Cases = 10.0   N of Items = 33

Alpha = .9456

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
SED1	49.9000	505.2111	.7597	.9778
SED2	49.5000	500.2778	.8933	.9744
SED3	49.5000	493.1667	.9477	.9733
SED4	48.9000	530.5444	.8065	.9763
SED5	48.8000	531.2889	.9297	.9750
SED6	49.2000	513.0667	.9013	.9744
SED7	49.8000	502.1778	.9587	.9731
SED8	50.1000	497.4333	.9511	.9732
SED9	49.8000	485.0667	.9832	.9725
SED10	49.9000	487.6556	.9325	.9737
SED11	49.6000	503.6000	.9122	.9740
SED12	48.5000	582.7222	.2405	.9834
SED13	49.7000	490.2333	.9789	.9725

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients

N of Cases =   10.0   N of Items = 13

Alpha =   .9769

****** Method 2 (covariance matrix) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	SED1	2.2330	1.2540	103.0
2.	SED2	2.4660	1.3047	103.0
3.	SED3	2.4272	1.3255	103.0
4.	SED4	2.4854	1.2975	103.0
5.	SED5	2.6408	1.3566	103.0
6.	SED6	2.3592	1.2591	103.0
7.	SED7	2.2330	1.1479	103.0
8.	SED8	1.9223	1.2182	103.0
9.	SED9	1.8447	1.2815	103.0
10.	SED10	1.8738	1.2578	103.0
11.	SED11	2.5049	1.3994	103.0
12.	SED12	4.6699	1.3090	103.0
13.	SED13	2.9515	1.2076	103.0

N of Cases = 103.0

Statistics for Scale	Mean	Variance	Std Dev	N of Variables
	32.6117	165.3183	12.8576	13

Item Means	Mean	Minimum	Maximum	Range	Max/Min	Variance
	2.5086	1.8447	4.6699	2.8252	2.5316	.5213

Reliability Coefficients 13 items

Alpha = .9438 Standardized item alpha = .9442

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	GEP1	1.7670	.5974	103.0
2.	GEP2	1.7573	.6488	103.0
3.	GEP3	1.6699	.7461	103.0
4.	GEP4	1.5146	.6548	103.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	6.7087	3.8947	1.9735	4

Reliability Coefficients

N of Cases = 103.0   N of Items = 4

Alpha = .7297

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	ERS1	1.6117	.6452	103.0
2.	ERS2	1.5534	.6676	103.0
3.	ERS3	2.2330	.9097	103.0
4.	ERS4	1.8447	.6680	103.0
5.	ERS5	2.7961	.8088	103.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	10.0388	4.4691	2.1140	5

Reliability Coefficients

N of Cases = 103.0   N of Items = 5

Alpha = .4697

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	GPMD1	2.6602	.6501	103.0
2.	GPMD2	2.8447	.9677	103.0
3.	GPMD3	2.8544	.9011	103.0
4.	GPMD4	2.9126	.8414	103.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	11.2718	7.9842	2.8256	4

Reliability Coefficients

N of Cases = 103.0   N of Items = 4

Alpha = .8526

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	GC1	1.8155	.6966	103.0
2.	GC2	1.8544	.7594	103.0
3.	GC3	1.8447	.7243	103.0
4.	GC4	1.9515	.7192	103.0
5.	GC5	1.5728	.7872	103.0
6.	GC6	1.8155	.8603	103.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	10.8544	10.2629	3.2036	6

Reliability Coefficients

N of Cases = 103.0   N of Items = 6

Alpha = .7950

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	GT1	1.8350	.7289	103.0
2.	GT2	2.0583	.8947	103.0
3.	GT3	2.0777	.8710	103.0
4.	GT4	1.9515	.7968	103.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	7.9223	5.6410	2.3751	4

Reliability Coefficients

N of Cases = 103.0   N of Items = 4

Alpha = .6892

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	GS1	1.8155	.7508	103.0
2.	GS2	3.2427	.8685	103.0
3.	GS3	1.4854	.7258	103.0
4.	GS4	4.2913	5.2424	103.0
5.	GS5	3.3689	.8164	103.0
6.	GS6	1.4951	.6549	103.0
7.	GS7	1.9029	.7477	103.0
8.	GS8	1.8155	.8372	103.0
9.	GS9	3.3495	.7760	103.0
10.	GS10	1.5825	.7609	103.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	24.3495	41.1708	6.4164	10

Reliability Coefficients

N of Cases = 103.0   N of Items = 10

Alpha = .2242

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	SED1	2.2330	1.2540	103.0
2.	SED2	2.4660	1.3047	103.0
3.	SED3	2.4272	1.3255	103.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	7.1262	11.6016	3.4061	3

Reliability Coefficients

N of Cases = 103.0 N of Items = 3

Alpha = .8494

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	SED4	2.4854	1.2975	103.0
2.	SED5	2.6408	1.3566	103.0
3.	SED6	2.3592	1.2591	103.0
4.	SED7	2.2330	1.1479	103.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	9.7184	18.8121	4.3373	4

Reliability Coefficients

N of Cases = 103.0 N of Items = 4

Alpha = .8778

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	SED8	1.9223	1.2182	103.0
2.	SED9	1.8447	1.2815	103.0
3.	SED10	1.8738	1.2578	103.0
4.	SED11	2.5049	1.3994	103.0
5.	SED12	4.6699	1.3090	103.0
6.	SED13	2.9515	1.2076	103.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	15.7670	31.5138	5.6137	6

Reliability Coefficients

N of Cases =   103.0   N of Items = 6

Alpha =   .8254

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	GEP1	1.7670	.5974	103.0
2.	GEP2	1.7573	.6488	103.0
3.	GEP3	1.6699	.7461	103.0
4.	GEP4	1.5146	.6548	103.0
5.	ERS1	1.6117	.6452	103.0
6.	ERS2	1.5534	.6676	103.0
7.	ERS3	2.2330	.9097	103.0
8.	ERS4	1.8447	.6680	103.0
9.	ERS5	2.7961	.8088	103.0
10.	GPMD1	2.6602	.6501	103.0
11.	GPMD2	2.8447	.9677	103.0
12.	GPMD3	2.8544	.9011	103.0
13.	GPMD4	2.9126	.8414	103.0
14.	GC1	1.8155	.6966	103.0
15.	GC2	1.8544	.7594	103.0
16.	GC3	1.8447	.7243	103.0
17.	GC4	1.9515	.7192	103.0
18.	GC5	1.5728	.7872	103.0
19.	GC6	1.8155	.8603	103.0
20.	GT1	1.8350	.7289	103.0
21.	GT2	2.0583	.8947	103.0
22.	GT3	2.0777	.8710	103.0
23.	GT4	1.9515	.7968	103.0
24.	GS1	1.8155	.7508	103.0
25.	GS2	3.2427	.8685	103.0
26.	GS3	1.4854	.7258	103.0
27.	GS4	4.2913	5.2424	103.0
28.	GS5	3.3689	.8164	103.0
29.	GS6	1.4951	.6549	103.0
30.	GS7	1.9029	.7477	103.0
31.	GS8	1.8155	.8372	103.0
32.	GS9	3.3495	.7760	103.0
33.	GS10	1.5825	.7609	103.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	71.1456	129.8119	11.3935	33

Reliability Coefficients

N of Cases =   103.0   N of Items = 33

Alpha =   .6620

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	SED1	2.2330	1.2540	103.0
2.	SED2	2.4660	1.3047	103.0
3.	SED3	2.4272	1.3255	103.0
4.	SED4	2.4854	1.2975	103.0
5.	SED5	2.6408	1.3566	103.0
6.	SED6	2.3592	1.2591	103.0
7.	SED7	2.2330	1.1479	103.0
8.	SED8	1.9223	1.2182	103.0
9.	SED9	1.8447	1.2815	103.0
10.	SED10	1.8738	1.2578	103.0
11.	SED11	2.5049	1.3994	103.0
12.	SED12	4.6699	1.3090	103.0
13.	SED13	2.9515	1.2076	103.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	32.6117	165.3183	12.8576	13

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
SED1	30.3786	141.8650	.7325	.9392
SED2	30.1456	138.8511	.8054	.9370
SED3	30.1845	136.1519	.8861	.9343
SED4	30.1262	140.0133	.7693	.9381
SED5	29.9709	139.5972	.7450	.9389
SED6	30.2524	140.5239	.7775	.9379
SED7	30.3786	141.3160	.8312	.9367
SED8	30.6893	141.3731	.7753	.9380
SED9	30.7670	138.8471	.8221	.9365
SED10	30.7379	138.9208	.8370	.9361
SED11	30.1068	138.0767	.7688	.9381
SED12	27.9417	156.6632	.2118	.9545
SED13	29.6602	147.5991	.5542	.9443

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients

N of Cases = 103.0 　　N of Items = 13

Alpha = .9438

Appendix 7.1. Full Pearson Correlation Coefficient Table

	GS1	GS2	GS3	GS4	GS5	GS6	GS7	GS8	GS9	GS10	SED1	SED2	SED3	SED4	SED5	SED6	SED7	SED8	SED9	SED10	SED11	SED12	SED13
GS1	1.000	.114	.004	.034	.112	.227*	-.172	.398**	-.107	.053	.421**	.269**	.425**	.214*	.185	.434**	.449**	.509**	.398**	.401**	.267**	.097	.433**
GS2		1.000	.185	.034	.329**	.218*	-.024	.224*	.251*	.170	-.007	-.066	-.057	-.010	-.108	.009	.169	.231*	.122	.100	-.078	-.438**	.432**
GS3			1.000	-.107	.208*	.232*	.178	.262**	.148	.655**	-.082	-.252*	.078	-.065	-.200*	-.064	-.137	-.079	-.002	.079	-.176	-.366**	.195*
GS4				1.000	.018	.417**	.047	-.135	-.040	-.104	-.028	.040	.054	-.221*	.009	-.191	.130	.040	.042	.151	.024	-.137	.180
GS5					1.000	.150	.220*	.301**	.274**	.282**	.126	.067	.215*	.088	.032	.223*	.232*	.266**	.336**	.113	-.002	-.188	.436**
GS6						1.000	.239*	.168	-.132	.242*	-.142	-.066	.014	-.136	-.085	-.087	.067	.122	-.013	.005	-.051	-.105	.155
GS7							1.000	.096	.346**	.152	-.070	-.114	-.047	-.163	-.112	-.015	-.110	-.084	-/118	-.117	-.009	-.053	-.081
GS8								1.000	.085	.140	.228*	-.118	.098	-.061	-.042	.184	.004	.207*	.083	.024	-.054	-.119	.156
GS9									1.000	.017	.329**	.128	.149	.151	.232*	.091	.139	.050	.164	.186	.224*	-.136	.154
GS10										1.000	-.113	-.296**	.091	-.031	-.166	-.016	-.067	.060	.144	.037	-.141	-.179	.212*
SED1											1.000	.562**	.636**	.526**	.609**	.698**	.623**	.622**	.651**	.659**	.631**	.191	.409**
SED2												1.000	.757**	.624**	.688**	.589**	.725**	.597**	.648**	.652**	.740**	.355**	.487**
SED3													1.000	.733**	.751**	.671**	.739**	.719**	.796**	.803**	.728**	.223**	.558**
SED4														1.000	.713**	.612**	.601**	.576**	.688**	.663**	.695**	.309**	.359**
SED5															1.000	.633**	.621**	.481**	.571**	.588**	.665**	.280**	.294**
SED6																1.000	.688**	.792**	.661**	.654**	.564**	.156	.508**
SED7																	1.000	.742**	.791**	.795**	.555**	.137	.673**
SED8																		1.000	.783	.768**	.512**	.008	.630**
SED9																			1.000	.791**	.569**	.057	.616**
SED10																				1.000	.633**	.052	.687**
SED11																					1.000	.472**	.328**
SED12																						1.000	-.240*
SED13																							1.000

*Correlation is significant at the 0.0.5 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Appendix 9.1. Interview Schedule

Question 1: the background of respondents (name, organisation, position).

Question 2: the environmental strategy and its characteristics.

Question 3: the reasons why respondents take environmental issues in their board meetings.

Question 4: problems respondents faced integrating environmental issues in strategic decision making.

Question 5: the respondents' knowledge of the green issues.

Question 6: the respondents' opinion on environmental issues in the future.

Question 7: whether respondents implement corporate environmental management.

Question 8: the respondents' opinion on the relationship between environmental issues and strategic making.

Question 9: the risks respondents faced (if any) pertaining to the elements of the environmental management they had implemented.

Question 10: the respondents opinions pertaining to the corporate environmental management.

Question 11: the respondents opinion on changes in corporate environmental management.

Appendix 9.2. Environmental Sustainability Evaluation Sheet: Company

Question	Sub-question	Answer	Value	Sub-scores
Is there any responsible person for environmental sustainability?		Yes No No Answer	1.00 0.00 0.00	
Who is responsible for environmental sustainability issues at the highest management level?		Top level Middle level Lower level No Answer	1.00 0.50 0.00 0.00	
Environmental sustainability policy	Does your company have a written environmental sustainability policy?	Yes, separate policy for environmental policy Yes, separate policy for social issues Yes, social and environmental issues together No No Answer	0.50 0.50 1.00 0.00 0.00	
Stakeholder involvement	Are stakeholders involved in strategic planning process concerning environmental and social issues?	Yes, for environmental issues Yes, for social issues No No Answer	0.50 0.50 0.00 0.00	
	The following stakeholders are involved	Shareholders Banks, Financial Institutes Regulators Critical consumers Media NGOs Suppliers Employees Trade Union Community No Answer	0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.00	
	How are stakeholders involved in the processes	Hearing and discussions Permanent advisory boards Main stakeholders are provided with information No Answer	0.10 0.30 0.10 0.00	
Strategic planning	What is your company's timeframe for strategic long-term planning	Up to 3 years 4 to 5 years 6 to 10 years More than 10 years No Answer	0.00 0.25 0.50 0.50 0.00	
Environmental sustainability targets	Does your company have written environmental sustainability performance target?	Yes, for environmental issues Yes, for social issues No Targets are available to	0.10 0.10 0.00 0.10	

		public Targets are for internal use only No Answer	 0.10 0.00	
Environmental sustainability benchmarking	Does your company benchmark its environmental sustainability performance to achieve best practice?	Yes, for environmental issues Yes, for social issues No with specification No Answer	0.25 0.25 0.00 0.00	
Environmental Report	Does your company produce environmental report?	Yes, integrated in annual financial report Yes, integrated in separate reports on annual basis Yes, published on the internet No No Answer	0.20 0.20 0.10 0.00 0.00	
Environmental Management System (EMS)	Is the implementation of a certified EMS?	Planned Partly completed in selected sites Completed company-wide No answer	0.20 0.30 1.00 0.00	
	Certification	ISO 14001 or EMAS or BS 7750 No Answer	0.5 0.00	
	Does your EMS incorporate a continuous process for improvements and target-setting?	Yes, on a yearly basis Every two years Irregular basis No No Answer	0.50 0.30 0.20 0.00 0.00	
Environmental Standards	Does your company have international environmental standards?	Yes No No Answer	0.50 0.00 0.00	
	The standards include	Air emissions Water emissions Waste Land use Use of resources No Answer	0.20 0.20 0.20 0.20 0.20 0.00	
Fines and civil penalties	What is the trend of fines and penalties paid by your company for environmental incidents?	Increasing Decreasing Constant No fines paid within the last three years No Answer	0.00 0.75 0.25 1.00 0.00	
Environmental liabilities	Does your company have environmental liabilities or is it a potential party for remediation?	Yes No Not known No Answer	0.25 0.75 0.00 0.00	
Your company has environmental policies to develop new products		Yes No No Answer	1.00 0.00 0.00	
Your company's products have been certified with Eco-labels		Yes, with reasonable specifications Yes, without specifications	1.00 0.50	

		No No Answer	0.00 0.00	