AN ANALYSIS OF THE QUALITY OF ENVIRONMENTAL DISCLOSURES IN THE ANNUAL FINANCIAL STATEMENTS OF SELECTED SOUTH AFRICAN COMPANIES AND A SUGGESTED ENVIRONMENTAL REPORTING MODEL

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DECLARATION

I hereby declare that this dissertation is my own work, and has not been submitted for a degree at another university.

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ABSTRACT

Environmental damage has become of widespread concern, so much so that some companies are disclosing environmental information in their annual reports, the traditional medium for communication to shareholders and other users. There is no recognised reporting model or framework for the reporting of environmental information. As a result, these disclosures are often ad hoc, and objective determination of their quality is extremely difficult. Furthermore, to the writer's knowledge, no survey of environmental disclosures has been conducted in South Africa.

The objectives of this dissertation included the determination of an appropriate environmental reporting model, based on the critical review of the accounting legal and economic literatures. The reporting model suggested is that of compliance with legal environmental standards, with certain additional financial information.

An existing disclosure index, enabling the objective measurement of environmental disclosure quality, was extended and adapted to the South African situation. Analysis of the index scores revealed an improvement in the quality of environmental disclosures over a five year period, and that disclosures are not influenced by a company's total assets or the presence of international shareholders.

Analysis of index scores on a group basis revealed that disclosures are not made as a result of a top-down approach. However, companies in similiar industries in a group tended to have almost identical disclosures.

Comparison of the results of the South African survey with a similar American one, revealed a significant disparity between disclosure scores for the oil, paper and steel industries. This disparity is exacerbated by the difference in time period of at least 15 years, and suggests that the difference in disclosure quality is possibly as a result of the disparity in content and enforcement of legal environmental standards. With the opening up of international markets to South African business, producers may no longer be able to ignore international environmental standards, and the poor quality of South African disclosures may well prove unacceptable. Without more effective legal environmental standards, there will be little progress towards improved environmental disclosures.

TABLE OF CONTENTS

	Page
Acknowledgements	i
Declaration	i
Abstract	ii
Table of Contents	iii
List of Appendices	iv
Chapter 1: Introduction	1
Chapter 2: Economics of Pollution	14
Chapter 3: Environmental Legislation and Regulations in South Africa	31
Chapter 4: Environmental Reporting	47
Chapter 5: Measuring the Quality of Environmental Disclosures	78
Chapter 6: Research Methodology	94
Chapter 7: Results	104
Chapter 8: Conclusion	139
Appendices	144
References and Bibliography	203

LIST OF APPENDICES

		Page
A.	Selected Environmental Statutes	144
B.	Environmental Obligations and the Information Needs of "Invisible" Stakeholders	147
C.	Environmental versus Traditional Obligations	148
D.	Marlin's Pollution Control and Emissions Reports	149
E.	Ernst and Ernst Social Responsibility Disclosure Survey (1978)	151
F.	Singhvi and Desai Index of Disclosure	153
G.	Buzby Index	154
H.	Barrett Index	156
I.	Wiseman's Environmental Disclosure Index	157
J.	Council on Economic Priorities Characteristics	158
K.	Dierkes and Preston Criteria	159
L.	Some German Pollution Reports	161
M.	Jensen's Physical Environment Impact Criteria	163
N.	Companies in the Sample, their Index Scores, and Industry Averages	165
O.	Comparison of South African and USA Disclosures	172
P.	Large Groups and Disclosure Scores	175
Q.	Number of Companies Reporting Each Index Item per Sector	181
R.	Index Scores per Subcategory	182
S.	Eskom's Environmental Audit Report	183
T.	Regression Analysis Information	185

CHAPTER 1: INTRODUCTION

1.1 General background to the problem 2

1.2 Specific problem to be studied 6

1.2.1 Objectives 7

1.3 Research approach 7

1.3.1 Hypotheses 8

1.3.2 Research methodology 9

1.3.2.1 A suggested reporting model 9

1.3.2.2 The quality of disclosures in South African annual financial statements 9

1.4 Scope, limitations and key assumptions 10

1.5 Expected contribution to knowledge 11

1.6 Brief chapter outline 12

1.1 General background to the problem

The technological advancement which commenced at the beginning of the Industrial Revolution and which still continues today, has resulted in the development of many convenient and often desirable products. Their production, however, frequently involves the generation of waste products, some of which are harmful to the environment. These waste products result in the pollution of the atmosphere, land and water. Accidents, for example oil spills at sea, and the discharge and/or dumping of unwanted items such as nuclear waste add to the overall damage inflicted on the natural environment.

Among the most noticeable examples of environmental damage are global warming, resulting in changing weather patterns, the hole in the ozone layer caused by the release of chlorofluorocarbons into the atmosphere, land degradation and water pollution. Man is not the only victim of the effects of pollution - the natural environment, even the earth itself, is being adversely affected. In fact, the earth as a closed system is no longer able to cope with the levels of emissions, due to the assimilative capacity of the natural environment being continually exceeded (Pearce, 1976).

Manufacturers of products are usually interested solely in profit maximisation, an inherently self-interested approach (Watts and Zimmerman, 1978). The result is that companies do not always consider themselves accountable for any environmental damage which may result from their production processes. It is only where negligence, or some such basis for a legal action, can be proved that the company may be forced to make compensation. This is (in basic terms) the present situation in South Africa.

Not all companies, however, consider themselves beyond accountability. A well publicised example of an oil spill and the resultant damage to the environment was the Exxon Valdez, which struck a reef on March 24, 1989. The corporation accepted full responsibility for the necessary clean-up costs (well in excess of the insurance cover), and completed the clean-up almost

three years later at a cost of over US$ 3 bn. This is widely regarded as the first major case in which a company voluntarily accepted responsibility for damage to the environment. Settlements to victims of large-scale disasters had previously been obtained only by means of legal action, for example the Union Carbide chemical accident in Bhopal, India. In South Africa, polluters are not brought to book to the same extent. Actions on behalf of affected people are not allowed in terms of South African law - direct injury or prejudice suffered must be proved by the plaintiff before a case can be heard. Thus damage to the environment without direct damage to an individual appears to be condoned by the South African legal system.

A recent example of an environmental court case in the United States of America is that of Occidental Chemical Corporation. Occidental took over Hooker Chemical Company in the 1960s, a company that had buried large quantities of toxic chemical waste in Love Canal, New York State. Occidental argued in their defence that the disposal methods used at the time of dumping were "state of the art", and therefore they should not be held accountable. The court, however, ruled that since Hooker was aware at the time of dumping that there could be contamination of the land in future, they were responsible for repairing the damage. Since Hooker had been acquired by Occidental, Occidental had to bear the costs. The past is therefore being judged by today's standards (Rubenstein, 1991). This strongly reinforces the application of the "polluter pays" principle, certainly in the United States of America.

The traditional historical cost-based accounting system cannot cope with the effects of environmental transactions, nor was it originally designed to. When the double-entry system of accounting was invented, damage to the environment was not an issue. The Occidental example illustrates the fact that where the polluter pays, environmental costs are not matched against income earned. Furthermore, in many instances costs are not borne by the polluter at all. Environmental costs are particularly difficult to measure due to the high level of uncertainty attached to their estimation. These difficulties include,

among others, determining a clear link between cause and effect, or the most appropriate discount rate and period to be used for the purposes of estimation. The traditional asset definition does not consider or allow for the inclusion of "natural capital" or common use property, and the liability definition ensures that forced economic sacrifices made outside the polluting entity are not recognised. The present traditional accounting framework thus appears to protect the polluter, albeit unintentionally.

Rubenstein (1991) provides an interesting discussion of the use of natural asset trust accounts, in particular in relation to the Hooker Chemical acquisition. A different purchase price would (or at least could) have been determined if the potential environmental costs had been brought into account. This, and other suggested treatments of the environmental effects of business are discussed in Chapter 4.

Another issue is the distinction between North and South, the first and third world countries, with regard to environmental policy. Most technological developments are initiated in the North, which has both more stringent environmental standards and better informed consumers. The poorer South consequently uses older and more polluting technology than the richer and more technologically advanced North, and therefore generates higher levels of pollution. This is further exacerbated by the sale of technology that does not meet the strict environmental standards of the North to the South.

Some of the third world countries, most notably India, have introduced clauses into their constitutions in an attempt to safeguard the environment. A similar clause may well be included in the new South African constitution when it is developed, since most political parties and resistance movements have some type of environmental policy (although some appear rather naive).

Such constitutional rights are becoming more important, especially since some philosophers have argued that people, including future generations, have the

right to protection of the aesthetic qualities of the environment (Donaldson, 1982). Corporations could therefore in some instances be seen to have the obligation to respect particular environmental rights, even where these are legally unenforceable. Some companies are in fact making environmental disclosures in annual financial statements possibly in an attempt to, inter alia, satisfy increasing consumer demands, or engender investor confidence in the company.

The latter is supported by a survey conducted by Business International (1990), which found that a third of responding United States of America companies considered environmental issues of central importance, with another 60% considering them important (in Miltz, 1992). It must however be borne in mind that these perceptions occurred in a business environment where environmental legislation is more comprehensive and enforced to a significantly greater degree than in South Africa. Thus the survey results cannot necessarily be assumed to hold in South Africa.

A point of concern, however, is that environmental disclosures could be a case of mere "greenwashing", rather than being meaningful. The evaluation of environmental disclosures is particularly difficult without full knowledge of the company's business and/or production processes. For example, Sappi's annual financial statements for 1990 included a large number of statements reflecting corporate concern for the environment. However, the annual financial statements for the following year did not continue the trend. Interestingly, the annual financial statements containing the environmental disclosures were produced after a spate of public outcry as a result of continued effluent spills into the local rivers. These disclosures therefore appear to be an attempt to limit the extent of the negative public and consumer opinion of the company. Another example of "greenwashing" of annual financial statements is that of Omnia Limited, a company in the chemical industry, which had a special feature on cycads as the primary focus of their 1990 annual financial statements. There

was not, however, any mention of corporate concern for the environment; the only concern expressed was for cycads.

A review of the annual financial statements suggests that disclosures made in the annual financial statements of companies appear to be rather ad hoc. This could be due to the fact that generally accepted accounting practice does not incorporate environmental reporting standards, for there is as yet no International or South African accounting statement or guideline governing environmental disclosures. There do not appear to have been any attempts to develop any such formal guidelines to date. Neither is a practicable reporting model, nor a detailed basis for the evaluation of the quality of environmental disclosures provided by the accounting literature. The paucity of the studies in the area indicates a need for the determination of a normative environmental reporting model.

Furthermore, to the writer's knowledge, no survey to assess the quality of any environmental disclosures has to date been carried out in South Africa, although some limited surveys using a variety of weighted indices have been carried out elsewhere (for example Wiseman (1982), Barrett (1976), Buzby (1974), Singhvi and Desai (1971)).

1.2 Specific problem to be studied

This study proposes to analyse the quality of pollution disclosures made in the annual financial statements of selected South African companies in highly polluting industries. Suggestions for an environmental reporting model will also be made.

In order to achieve this, the following objectives have been determined.

1.2.1 Objectives

1. To review the accounting, economic and legal literatures and determine an appropriate environmental reporting model.

2. To use and extend an existing indexing/weighting method to evaluate the quality of environmental disclosures contained in the annual financial statements of South African companies operating in selected potentially polluting industries (these industries will be selected by reference to the Environment Conservation Act, no 73 of 1989).

2a. To determine whether the quality of environmental disclosures of companies in the oil, steel and paper industries was lower than in their American counterparts (these being the industries evaluated in Wiseman (1982)).

2b. To determine whether or not there has been an improvement in the quality of such disclosures over the period of 5 years represented by 1986/87 and 1990/91 annual financial statements..

2c. To assess whether or not the quality of environmental disclosures is influenced by company size or the existence of significant foreign shareholders.

1.3 Research approach

Wiseman's indexing approach (Wiseman, 1982), unlike those of the other authors mentioned above, involved differentiating between different degrees of "specificity" of environmental disclosures in the weighting of index items. Thus this approach seems to be the most objective, and the most suitable for modification to the South African situation. Refer to Chapter 5 for a detailed discussion of indexing techniques as measures of disclosure quality.

1.3.1 Hypotheses

The hypotheses relating to the objectives are the following:

1. The most appropriate environmental reporting model, from both legal and economic perspectives, includes the recording, and measurement, of compliance with legal environmental standards.

2a. The quality of environmental disclosures in the oil, paper and steel industries (the industries considered in Wiseman's 1982 study) is low in comparison with their American counterparts.

2b. The quality of environmental disclosures has improved over the period examined (1990/91 annual financial statements compared directly to 1986/87 annual financial statements

2c. The quality of environmental disclosures is positively influenced by the reporting entity's size (measured by total assets) and the presence of significant foreign shareholders.

1.3.2 Research methodology

In order to test or fulfil these hypotheses, the following approaches will be adopted.

1.3.2.1 A suggested reporting model

The environmentally-related accounting literature in relation to the legal and economic literatures concerned with the environment will be critically reviewed and evaluated. The various possible environmental reporting models will be discussed, and the most appropriate one determined and substantiated, drawing on all three literatures (legal, economic and accounting).

1.3.2.2 The quality of disclosures in South African annual financial statements

By means of a survey of the literature, a list of index items to assess the quality of environmental disclosures will be developed. The relative weighting of the index items, as well as the assignment of scores where these items are disclosed, will be determined and justified. Singhvi and Desai (1971), Buzby (1974), Barrett (1976) and Wiseman (1982) deal with various weightings and allocation of scores, which will be used as a basis for the determined index.

The most recent (i.e. 1990 or 1991 year end, whichever is later and published before mid December 1991) annual financial statements of companies listed on the Johannesburg Stock Exchange in each of the selected potentially polluting sectors will be surveyed (these sectors are listed in the chapter devoted to research methodology). Eskom, an unlisted company in the power generation industry (a sector that does not include any listed companies and hence is not mentioned above) will also be included, as the Environment Conservation Act refers to utility companies as potential polluters.

Index scores will be assigned to the annual financial statements. The effects of the size of the company (in terms of total assets) and the presence of international shareholders, if any, on environmental disclosures will be assessed.

1.4 Scope, limitations and key assumptions

Measurement problems inherent in the monetary estimation of environmental costs or benefits will not be considered. "Monetary reductionism is viewed by most accountants as almost of axiomatic necessity" (Miltz, 1992). In addition, the often divisive philosophical viewpoints associated with the various decision making frameworks for monetary estimation are not considered of fundamental importance to the accounting disclosure issue. Accounting is merely a means of supplying information, which generally influences users' perceptions. It is up to the different categories of users to decide how to use the information presented to them.

Unlike other surveys in the literature, comparisons of a company's disclosed performance (as measured by the index) with its actual performance (as measured by statutory limits) will not be made. The present lack of strictly applied and enforced statutory environmental standards in South Africa precludes this comparison. Instead, any comparisons would have to be made relative to an "ideal" statutory situation, possibly determined by using statutes of other countries as a starting point. The determination of such an "ideal" statutory situation is beyond the scope of this dissertation.

Moreover, this study will be limited to publicly available information in the form of company financial statements. No other environmental reports (such as special advertisements or publications) which may have been issued by companies will be considered due to the practical problems associated with testing such information.

This limitation to corporate annual financial statements is supported by Maunders and Burritt (1991), who argue that the four fundamental concepts of conventional accounting, namely going concern, accruals, consistency and prudence, cannot be applied to environmental or ecological issues or information. It may be argued that this criticism applies to external financial reporting, and not to information for decision making. However, the former

often determines the latter (Johnson and Kaplan, 1987) in many business entities. Maunders and Burritt conclude that for most "outside" users, the basis for decision making is external financial reporting.

1.5 Expected contribution to knowledge

Over the past few decades, environmental degradation has become more noticeable in South Africa. This is consistent with the international situation - widespread environmental degradation was accepted as a pressing global rather than local problem at the 1991 Rio de Janiero summit.

It has been argued that in order to indicate their concern for the environment, or perhaps to engender investor confidence, disclosures regarding the impact of company activities on the environment are being made by some companies. Many companies consider the annual financial statements to be a means of communicating information to a variety of users, including but not limited to shareholders alone (Belkaoui, 1985). Environmental disclosures in annual financial statements are extremely diverse, and at present there is no strict framework comprising either accounting or legal standards against which to evaluate the environmental performance of a company. Hence there is a pressing need for an objective measure of the quality of environmental disclosures, both from a general user and a potential standard setting point of view.

The indexing method proposed will provide such a measure, and the consideration of environmental aspects of economic and legal thinking will provide a more holistic approach to the reporting of the impacts of businesses on the environment.

It is expected that the study will demonstrate that:

a) the quality of environmental disclosures improved over the 5 year period (1986/7 to 1990/91);

b) the quality of South African environmental disclosures in the oil, paper and steel industries is less than that of their American counterparts;

c) quality is a function of a company's size and international shareholders (if applicable); and

d) compliance with statutory environmental standards is considered to be the most appropriate environmental reporting model. It is auditable, and costs are not an inhibiting factor if compliance with standards is legally required.

1.6 Brief chapter outline

Chapter 1 set out the general background to the problem, the research approach and the expected contribution to knowledge.

Chapter 2 deals briefly with the economics of pollution. Externalities, and methods of controlling externalities are discussed. The concept of sustainable development is also discussed.

Environmental legislation and regulations in South Africa are discussed in Chapter 3. Common law, environmental standards and both recent and future legal developments are considered.

Chapter 4 deals with environmental reporting from the accountant's point of view. The demand for, and proposed approaches to, environmental reporting are considered, and an environmental reporting model is proposed.

Chapter 5 highlights the various methods of measuring the quality of environmental disclosures, and the research methodology is set out in Chapter 6.

Survey results are presented in Chapter 7, and conclusions are set out in Chapter 8.

CHAPTER 2: ECONOMICS OF POLLUTION

2.1 Introduction **15**

2.2 Environmental problems **17**

2.2.1 Pollution **17**

2.2.2 The tragedy of the commons **18**

2.2.3 Property rights **19**

2.2.4 Externalities **20**

2.2.5 Optimal levels of pollution **22**

2.2.6 The "polluter pays" principle **22**

2.3 Sustainable development and instruments of environmental management **24**

2.3.1 The Coase Theorem, or negotiations **24**

2.3.2 Effluent taxes **25**

2.3.3 Emission standards or quotas **26**

2.3.4 Marketable emissions permits **27**

2.3.5 A hybrid approach **29**

2.4 Concluding remarks **30**

2.1 Introduction

Environmental economics is a relatively new branch of economics, which developed when environmental problems became of general concern. The approach generally adopted is primarily normative, and aims to provide inter-generational equity as regards the use and allocation of natural resources.

Environmental problems have been recognised by resource managers as being a direct consequence of economic activities (Kneese, 1977). These problems are not new, but appear to have crept up on modern governments, which are now faced with the accumulated effects of long-term pollution. The cause of environmental problems has been attributed by some economists to economic development, who then argue that economic growth should be restricted, while other economists argue that economic growth is necessary for any improvement in environmental quality. Differences in opinion experienced in this area have been considered to be a direct result of imprecise definitions of economic terms (Fuggle and Rabie, 1983). Therefore, the real issue may be not merely whether there should be some degree of economic growth, but rather the efficient, equitable and sustainable allocation of resources in order to achieve real economic development. It is only by means of this approach that environmental problems may be resolved (Fuggle and Rabie, 1983).

Hotelling (1931) wrote that the

"(c)ontemplation of the world's disappearing supplies of minerals, forests and other exhaustible assets has led to demands for regulation of their exploitation. The feeling that these products are now too cheap for the good of future generations, that they are being selfishly exploited at too rapid a rate, and that in consequence of their excessive cheapness they are being produced and consumed wastefully has given rise to the conservation movement."

The economics and ecology of human development are becoming increasingly interlinked. As a result, there have been moves to attempt to encourage the development of strategies that allow for the needs of the current generation to be met without adversely affecting those of future generations. Early proponents of this view contended that the answer to environmental problems

lay in zero growth. The emphasis has subsequently shifted to ensure that the long-term productive nature of the environment is maintained. This concept of sustainable development is important when considering the survival of the planet and all species on it, including the human race. As mentioned previously, the earth, "Spaceship Earth", is a closed system, one which can no longer assimilate the levels of waste being produced or regenerate non-renewable resources. Unless we are to leave a legacy of decreased standards of living caused by continual uncontrolled development to future generations, limits to development in the form of criteria for evaluating the efficiency, effectiveness and sustainability thereof are vitally necessary. Sustainable development is thus of paramount importance.

Market systems have encouraged the exploitation of basic resources, their processing and distribution, and have functioned extremely efficiently in this regard. But the efficient disposal of residuals, or effluents, into common property resources has not been encouraged at all. This is a fundamental failing of the market systems, which is further aggravated in some instances by tax incentives and inequitable quotas granted to polluters.

The back jacket of "Our Common Future", the report of the World Commission on Environment and Development, warns that

"(m)ost of today's decision makers will be dead before the planet suffers the full consequences of acid rain, global warming, ozone depletion, widespread desertification, and species loss. Most of today's young voters will be alive.

The World Commission on Environment and Development, ... was set up as an independent body in 1983 by the United Nations. Its brief was to re-examine the critical environment and development problems on the planet and to formulate realistic proposals to solve them, and to ensure that human progress will be sustained through development without bankrupting the resources of future generations.

Our Common Future serves notice that the time has come for a marriage of economy and ecology, so that the governments and their people can take responsibility not just for environmental damage, but for the policies that cause the damage. Some of these policies threaten the survival of the human race. They can be changed. But we must act now."

This chapter is not meant to provide the reader with a comprehensive and in-depth knowledge of environmental economics. Its purpose is merely to highlight economic principles which are important to obtain a rounded inter-disciplinary understanding of environmental issues.

2.2 Environmental problems

2.2.1 Pollution

Environmental problems can be classified as either pollution, or resource destruction. Resource exhaustion or depletion is due to the necessary use of resources in a production process. Resource destruction, however, occurs inadvertently as a result of indirect or unintended pressures on a resource.

Since the earth is a closed finite system, the use of non-renewable resources results in their becoming scarce. These resources need to be managed carefully, in case effective substitutes are not discovered. This is, however, generally problematic, since formal property rights to such non-renewable resources are often neither defined nor existent. The resulting external costs of pollution or resource destruction have received attention in the economic literature. One approach involves determining the optimal level of pollution (i.e. that level of pollution having the least adverse effect on the natural environment), and penalising the polluter based on pollution levels over and above that optimal level.

Pollution is defined here as being dependent on some physical effect of waste, as well as a human reaction to that effect. That is, pollution is defined as the residuals of human activity which have an adverse effect on the following user of an economic resource.

The human reaction to an effect of physical waste is referred to as a loss of welfare, or, alternatively, as a loss of utility or satisfaction. So, if a person suffers from a smog-related lung disease, he has experienced a loss of welfare,

both in terms of his physical health, and in terms of a probable decrease in expected future income. It is for this reason, loss of welfare, that welfare economics has to be combined with ecology when attempting to find solutions to current environmental problems.

2.2.2 The tragedy of the commons

Population growth has resulted in increased pressure being exerted on common property, property which everyone has the right to use. Where a person aims to maximise his benefits by using the property, he will tend to overuse it, because the cost of his doing so is borne by others. The result is an overall decrease in the usefulness of the property due to, for example, overgrazing.

This "tragedy of the commons" was first outlined by Hardin (1968). The tragedy occurs because nothing that man does can halt the process of overuse. It also occurs in cases of pollution where effluents are discharged into common property, thereby diminishing the property's usefulness.

This is well-described by Demsetz (1967) in his article on the development of private property rights:

"Suppose that land is communally owned. Every person has the right to hunt, till, or mine the land. This form of ownership fails to concentrate the cost associated with any person's exercise of his communal right on that person. If a person seeks to maximise the value of his communal rights, he will tend to overhunt and overwork the land because some of the costs of his doing so are borne by others. The stock of game and the richness of the soil will be diminished too quickly. It is conceivable that those who own these rights, i.e. every member of the community, can agree to curtail the rate at which they work the lands if negotiating and policing costs are zero...[However,] negotiating costs will be large because it is difficult for many persons to reach a mutually satisfactory agreement, especially when each hold-out has the right to work the land as fast as he pleases. [Furthermore,] even if an agreement among all can be reached, we must yet take account of the costs of policing the agreement, and these may be large, also."

Therefore, even if it is in the interests of all users of communal natural resources, these users will fail to reach agreement on effectively managing the

resource. Free riders will always take advantage of the environmentally conscious behaviour of other users. It is for this reason that intervention is perceived to be necessary, either by the state, the legal system, or community leaders. This could be achieved by the redefinition of property rights, or some form of regulation.

However, where the management of global resources is concerned, intervention by the bodies or individuals mentioned above may not be enough. There is no formal structure which has the jurisdiction to manage the affairs of the world. The United Nations has an environmental program, but the explicit agreement of involved persons has to be obtained before any recommendation will be implemented. Some countries may ignore these issues entirely, possibly due to indifference or a lack of funds, or merely because they would like to free-ride.

An opposing view was taken by Barrett (1990), who argued that the tragedy of the commons need not actually occur where co-operation is not forthcoming. The prevailing opinion in the economic literature is, however, that common property will be exploited.

2.2.3 Property rights

Pollution is caused by producers in instances where property rights, that is, the rights to use or abuse property in a certain specified state, are either non-existent or are not enforced in a polluted environment. For example, water is a so-called "free good", that is, one over which no specified individual(s) have the right to exclusive use. If a farmer has specific property rights to clean river water, he can either claim compensation from a polluting factory situated upstream from his farm, or demand that the pollution is rendered harmless before being expelled into the river. However, where these rights are unspecified or unenforceable, as in the case of common property, the result is an undesirable situation from the farmer's, as well as society's, point of view. In general, it appears that non-polluters tend to underuse and polluters to overuse the environment.

For pollution to be adequately controlled, there needs to be a stricter definition of property rights, one which ensures that the general public have legally enforceable rights over common property, across national boundaries.

2.2.4 Externalities

The effects of pollution imposed on society by businesses (or individuals or governments), some of which have been mentioned above, are known as externalities. These externalities, or external costs, are external to the decision-making process of the profit maximising firm. Generally, a firm only considers its private costs, the costs that it will have to bear. The external costs are ignored, and this is the point at which problems of accountability begin.

Externalities do not include the case where a person deliberately acts to reduce A's utility or welfare. This reduction in A's utility is internal to the decision-making process - it is an expressly desired objective. That there is no element of choice on A's part does not mean that such an act would be regarded as an externality - a conscious decision had been taken to reduce A's welfare.

Furthermore, before an item can be considered an externality, the decision maker, who affects the utility of others, should not receive (pay) in compensation an amount equal to the net value of the benefit (loss) to others generated by his actions. The receipt or payment of compensation would bring the externality under the consideration of the polluter, thereby internalising it. This criterion ensures that externalities have all of the characteristics (negative or positive, such as resource misallocations or inefficiencies) one would expect.

In summary, an externality exists when both one agent's activity causes a loss of welfare to another, and that loss of welfare is uncompensated.

When developing a pollution control policy, two issues need to be considered: by how much should pollution be reduced, and who should bear the costs of this pollution reduction? From a purely social perspective, externalities

generated by a producer should be borne or realised by that producer, not simply ignored or passed on to others.

There are two ways in which to achieve such internalisation of externalities, namely:

1. to reduce output until the social value of a good is reduced to the marginal cost of production, thereby reducing pollution levels. In this instance the market value of the good would be affected;
2. to add the value of the externality to private marginal cost to get social marginal cost. In this case, the market price of the good remains unaffected, but some system of taxes or quotas is necessary.

One of the major problems faced by any person who wishes to internalise or assess the impacts of externalities is that of valuation. This is due in part to the fact that cause and effect relationships are difficult to identify. For example, one factory may emit a chemical into the atmosphere, which, on its own, is harmless. But when combined with that emitted by a factory next door, also harmless, it forms a compound which causes extensive damage. It is almost impossible to determine the extent to which each factory can be held responsible for the resultant harmful chemical compound.

The problem is further exacerbated by the fact that many systems (social, physical, economic etc.) interact to produce an externality. Thus the consequences of a particular externality cannot be attributed to a specific industry. In addition, externalities are generally intangible, such as a deterioration of quality of life, and measurement is necessarily affected by the extremely subjective levels of awareness and perception of a particular society. The absence of complete information, and uncertainty as to the full future effects of an existing externality mean that the value placed on that externality today will probably differ from that placed on it by future generations.

Although these measurement issues are important, they will not be expanded on as they are beyond the scope of this dissertation.

2.2.5 Optimal levels of pollution

It is important to note that the total eradication of pollution is an unrealistic goal. Since production of products necessarily involves the production of waste matter (from the second law of thermodynamics), for there to be no pollution (or waste production) there would have to be no production at all. This would involve a zero level of economic activity, which is clearly unacceptable. Hence pollution *per se* must be accepted as an inevitable consequence of economic activity. However, this does not imply that the arbitrary production of pollution is desirable - one should aim to produce the "optimal" level of pollution, produced at the level of activity at which the marginal external costs to society equal the marginal net private benefits to the producer.

Since the earth, however, has the ability to assimilate waste only to a certain extent, this assimilative capacity should also be included in the analysis. The marginal level of economic activity at which all waste is assimilated by the environment is that point at which one additional unit of waste above that level would not be assimilated. Zero pollution then no longer implies zero production (as it did from a purely scientific perspective). Rather, production up to and including the assimilative capacity of the earth would result in zero pollution.

2.2.6 The "polluter pays" principle

The "polluter pays" principle is widely accepted as a means of internalising externalities. Where property rights are undefined, or are unenforced, and the number of polluters and victims is too large for effective and affordable negotiation, victims of pollution should never be compensated by polluters, or, in fact, by any other body from tax revenue. This is primarily because individuals could then place themselves in a position to become victims, and

hence claim compensation, when they would not have done so otherwise. This would result in an inequitable situation, since the polluter could be obliged to pay more in compensation than otherwise strictly necessary.

However, where the number of victims and polluters is finite, and negotiation would then be relatively costless (or virtually costless in comparison to situations involving large numbers of parties), such payments to victims could be made. If a victim and polluter negotiate and the victim enforces his property rights to an unpolluted environment, he can claim compensation from the polluter in order to offset the damage he has been forced to suffer. It is only in cases where property rights are poorly defined or nonexistent, or unenforced, or the number of affected parties is large, that polluters should never compensate victims.

An alternative compensation approach was suggested by Coase (1960), namely that the sufferers (as opposed to the makers) of an externality should be taxed in an attempt to induce them to move away. This would occur only in situations where the polluter held the property rights - in this case, sufferers would not be able to claim compensation from the polluter. However, where externalities are widespread, then there may be no alternative externality-free or -superior location for the sufferers to move to, which is clearly inequitable. Baumol and Oates (1988) countered that victims should never be taxed unless they can pass on the externality, in which case they would be taxed on the amount passed on (as though they were polluters).

If it is accepted that polluters must pay, it remains to determine in what form, to whom, and how much payment should be made. These are all major problems in their own right, and will be dealt with separately in the section devoted to instruments of environmental management.

2.3 Sustainable development and instruments of environmental management

Classical economic theory does not recognise differences between forms of capital. However, when considering sustainable development it is important to distinguish between man-made and environmental capital. In order for man-made capital to increase, some environmental (or natural) capital is often used. This decrease in natural capital is usually ignored when determining increases or decreases in man-made capital. However, sustainable development requires that changes in environmental capital are in fact taken into account, and that they are allowed only where it can be demonstrated that a decrease in the amount available to future generations is more than compensated for by the corresponding increase in man-made capital.

The Pearce Report (Pearce et al, 1989) suggested the adoption of a new measure of national income (the present measure ignores the environment), the introduction of market interventions (taxes and incentives based on the "polluter pays" principle), as well as government and private sector co-operation as methods of control to prevent the erosion of natural capital.

Other means of achieving the optimal level of pollution include a stricter definition, and enforcement of, property rights, and the complete prohibition of any activity which will result in the externality being generated (which is clearly ridiculous).

A brief discussion of the various techniques of environmental management suggested in the economic literature, and some of their respective advantages and disadvantages, now follows.

2.3.1 The Coase Theorem, or negotiations

Coase (1960) suggested that although markets alone may not limit externalities to optimal levels, they can be gently persuaded in that direction without the aid of regulatory activity. A process of negotiation is advocated in cases where the

costs of negotiation are not prohibitive, and there are few people generating and being affected by the externality.

However, the bargaining solution does not apply under conditions of imperfect competition. Furthermore, the parties to any bargaining process are difficult to determine.

Also, these bargaining processes are difficult to observe in reality. Since externalities are pervasive rather than isolated, bargaining examples should be commonplace. One of two options holds: either there are real obstacles to bargains in the form of transactions costs, or the Coase theorem is not applicable to real-world economics. It has been demonstrated (Pearce and Turner, 1988) that the Coase Theorem cannot be falsified, and therefore it does not meet the criteria for an acceptable theory.

A bargaining approach will not, therefore, be an effective means of environmental management.

2.3.2 Effluent taxes

A system of taxes and subsidies was developed by Pigou in his Economics of Welfare (1920) on those imposing negative and positive externalities respectively. These taxes are based on damage inflicted on the environment, and optimal levels of pollution are encouraged. In reality, the achievement of optimal levels may not be practical or possible, therefore acceptable levels of pollution need to be determined instead. Any system of pollution charges should encourage the use of pollution abatement equipment. Therefore the determination of Pigouvian taxes should also allow for pollution abatement costs.

The determination of a tax is heavily dependent upon the producer's property rights. Where the polluter has no right to use the environment as a sink for waste, then the pollution charge appears acceptable. Where a producer has the

right to emit at the optimal level of pollution, the tax at the optimal level should not be applied.

Baumol and Oates (1988) showed that where standards or quotas are determined without taxes, they will be more expensive than the taxes alone. Thus taxes will be the cheaper method of achieving a given standard, necessitating a lower level of taxes than abatement costs to achieve that standard. Therefore taxes are more likely to occur in practice than quotas.

There are, however, several practical difficulties commonly experienced with the use and implementation of taxes. The first is that taxes and bargaining are mutually exclusive - that is, taxes cannot operate effectively where property rights are sufficiently well-defined to allow for corrective action in the form of a negotiated settlement to be made.

Secondly, in the case of imperfect competition, specifically where monopolies exist, society's optimal level of production is ignored. The imposition of taxes would cause the level of production to drop below the socially optimal level. The resulting loss to society outweighs the gain achieved by the imposition of a tax. Therefore in the case of a monopolistic industry one would need to tax pollution and subsidise production.

Fourthly, knowledge of at least part of the total "damage" function is necessary for the determination of a Pigouvian tax. Optimal levels of pollution often cannot be determined in practice due to the uncertainty surrounding the damage curve's estimation. However, the use of approximations does provide "ballpark" figures for determination of the tax to be imposed.

2.3.3 Emission standards or quotas

Quotas occur where the maximum level of pollution is determined and allocated across industries. Each industry in turn allocates an allowance, or

quota, to each company. These quotas then represent the maximum permissible level of pollution for each company.

As far as the spectrum of instruments for environmental control are concerned, taxes and quotas are on opposite ends of the spectrum. Taxes would be levied at a fixed rate per unit of effluent produced regardless of the polluter's environmental record, whilst quotas would have to be set for each individual polluter, or each industry and then allocated to polluters in that industry. These would both be extremely subjective, and inefficient.

Abuse of the quota system could occur, if for example, bribes were used by a polluter to obtain a larger quota. In addition, the determination and enforcement of penalties may also be compromised, especially in a legal system in which control is fragmented such as in South Africa (refer Chapter 3 for further discussion in this regard).

Where the quotas allocated to individual polluters are not be marketable, they would provide no incentive to reduce or minimise pollution levels. This system would appear to encourage the continued existence of the status quo, probably reinforced by an allocation of quotas based on historical pollution levels. Where, however, the quotas or permits are marketable, the market would iron out any initial inequities as well as provide an incentive to reduce emissions levels.

2.3.4 Marketable emissions permits

In an effort to provide incentives to polluters to reduce or minimise their levels of pollution, marketable emissions permits or tradeable emissions rights have been utilised in the United States of America. The government determines the optimal overall level of pollution and issues permits, in physical units of emission, up to that level. Then companies which produce more pollution than they have permits for would be obliged to purchase more permits or reduce emissions levels. Similarly, a firm with a surplus of permits (i.e. emitting at a

lower level than it has permits for) can sell those permits. In both cases, firms are better off, and there is an incentive to reduce emissions. An advantage of this approach is that standards need not be set for each pollution source, but for the total economy. An additional advantage is that environmental groups could purchase some of those permits, thus forcing the total pollution levels to decrease. However, this system would only be effective if government guarantees that no additional permits would be issued in future.

The market in these tradeable rights would stabilise over time, with going prices per ton being assigned to each right. Furthermore, the marginal costs of abatement would be equalised and the treatment of abatement at both the production and end-user stages would be encouraged by means of this system. This would result in a system of pollution control equivalent to taxes under conditions of perfect certainty.

There are several advantages of marketable permits over taxes. The first is that marketable emissions permits have been demonstrated to operate more cost-effectively than set standards over time (Baumol and Oates, 1988).

Secondly, the uncertainty and abatement costs associated with attaining legally required levels of pollution would be reduced. The risk of standards not being met due to errors in the initial estimation of the tax would be countered. Also, the tax itself, and any subsequent changes in its amount, may meet with considerable resistance, while the marketable permits provide the polluter with some element of choice.

Thirdly, adjustments to the amounts of taxes imposed due to the effects of inflation and increases in levels of economic activity would be necessary. Emissions permits, however, would be governed by market forces which would automatically make adjustments for inflation and economic growth.

Furthermore, the physical location of a polluter can adversely affect the effectiveness of a system of taxes. A polluter in an industrial area should have to pay a greater tax than a polluter in a relatively unpolluted area (where, for example, effluents are assimilated by the surrounding environment to a greater extent). This would necessitate the determination of a tax at each pollution source, a task which would be cumbersome in the extreme. The marketable permits can, however, address this issue, provided that they are allocated on a regional basis.

2.3.5 A hybrid approach

Although marketable emissions permits appear to be the most appropriate instrument for environmental control, a hybrid or combination of instruments may be the most effective technique in certain circumstances. Baumol and Oates (1988) suggested that "an effective overall program for the management of environmental quality will be one that embodies the appropriate *mix* of (the various policy) tools".

Robert and Spence (1976) constructed a "mixed" instrument, incorporating marketable permits with an effluent fee as well as a subsidy. The subsidy is granted where a polluter has unused permits. A polluter is therefore not necessarily encouraged to dispose of any surplus of units, as he could be in the case of marketable permits alone. The effluent fee is used to correct for any adverse effects caused by the incorrect estimation of marketable securities needed. The fee would be charged on emissions exceeding the permit levels, so a polluter need not obtain any permits at all. The polluter therefore has a greater degree of choice, and a hybrid system such as this one may be considerably easier to motivate, and be more acceptable to polluters, especially during its introductory stages.

2.4 Concluding remarks

This chapter does not provide a comprehensive and in-depth discussion of environmental economics. The concepts and instruments of environmental management considered here are important, especially if one is to attempt to formulate an environmental reporting model. It would, however, be extremely naive to attempt to do so without considering the economic aspects of the environment. Furthermore, any system of environmental management necessarily involves the imposition of some form of environmental standards.

3.1 Introduction

Environmental law as such is a relatively new branch of law, developed predominantly since the early 1970's when environmental protection and conservation and the related legal issues became of general concern. The roots of South African environmental legislation can be traced back to the seventeenth century (Fuggle and Rabie, 1983), when various common law rights were established. Together with the increasing evidence of environmental degradation in recent years environmental legislation has become more sophisticated.

The scope of environmental law is hard to define. Because of its nature, it has to be interdisciplinary as regards both natural science and law, as well as the various branches of law. Fuggle and Rabie (1983) suggested the following open-ended definition:

"Environmental law encompasses all legal rules aimed at the conservation of the earth's natural resources and the control of environmental pollution".

In recent years the South African legal system has, to differing extents, been involved in decisions affecting a wide variety of environmental issues: from mining the eastern shores of Lake St. Lucia, to seal culling, to building a toxic waste incinerator on the west coast, to resettling people in north-eastern Natal, to establishing a marina at Robberg near Plettenberg Bay, to Kaolin mining at Chapman's Peak. It is thus apparent that the application of environmental law is extremely wide-ranging.

Glazewski (1991b) suggested that the scope of environmental law could be adapted to include the following inter-related and non-exclusive components: resource conservation and management; land-use planning and spatial development; and pollution control and waste management. The author stressed that these components are not mutually exclusive groupings. Each of these components will be discussed in the South African context in a later section of this chapter.

3.2 Common Law

Although the indigenous population of Southern Africa had a well developed respect for Nature, South African law is based on the Roman and Roman-Dutch common law principles introduced by Jan Van Riebeek in 1652. Pollution control and waste management cannot easily be based on this common law foundation for the following reasons.

Common law makes provision for private remedies in cases of pollution, applicable only when one individual suffers directly as a result of another's actions. The principles relating to pollution control have been built up around private law rights - the right of use, enjoyment and abuse of property (property rights), and, to a lesser degree, personal rights. These rights imply that people (here people is taken as including all legal persons) should not exercise their private rights in a way that will adversely affect other individuals' rights. Thus the area of neighbour law (similar to the English law of nuisance) is important in South Africa. It is of limited application, since the victim has to prove a causal link between the pollution and their suffering, generally a difficult task.

The Roman-Dutch rule "sic utere tuo ut alienum non laedas" established the principle that an individual may not use his property in a way which would harm another. This rule does not apply to strictly adjacent neighbours, although it was developed largely in that area, since a property owner downstream from an upstream owner has rights vis-à-vis that upstream owner, even though their properties are not adjacent. For a discussion of some recent cases utilising this principle see CSIR (1991).

However, the available private law remedies are only applicable to specific identifiable victims who are also able to afford the costs of legal action. Thus pollution cannot be controlled by private law alone. The rights of the public in general to a certain minimum quality of the environment should also be legally controlled in some manner.

Although Roman-Dutch law contained a provision called the "actio popularis" in terms of which any member of the public could bring an action in the public interest, this has not been adopted by South African law. The courts have insisted that the applicant in any legal case must have "locus standi" (legal standing). That is, he must have an "interest" in the subject matter of the case. "Interest" has not been clearly defined by the courts, but it is seen, in general, as meaning a direct, substantial, personal or special interest in the matter before the court. This implies that the applicant must have rights greater than those of the general public. Therefore any pollution and waste management issues affecting the general public are at present excluded from judicial proceedings.

Some cases have deviated slightly from the "locus standi" requirement. Organisations or associations formed around a specific cause, for example the S.P.C.A. (Society for the Prevention of Cruelty to Animals), have recognised legal standing. These cases, however, are few and far between, with public rights and access to the judicial process being in general severely curtailed (CSIR, 1991).

Pollution law necessarily involves the consideration of public rights, and it has been suggested (CSIR, 1991) that the ambit and scope of public participation be widened by statute by, for example, granting selected associations or monitoring groups locus standi.

3.3 Environmental Standards

As mentioned before, the determination of environmental standards is essential from an economic theory, and hence from a legislative control, point of view. Most forms of human and economic activity result in the production of waste; however, the point at which such activity crosses an agreed upon threshold and as a result has legal implications, needs to be determined. National economic, social and public health policies, as well as public policy, should be taken into account when setting standards.

The standard-setting process involves two broad stages:

1. identifying, classifying, evaluating and assessing the potential or observed hazard;
2. determining policy as regards political, legislative and administrative matters. So, for example, economic considerations and the implementation of determined standards would be dealt with in this policy-determination stage.

It should be noted that standards can be imposed both at the source of the pollution (by setting uniform effluent standards) and from the receiving environment's point of view. The former, being uniform, is easy to control, while the latter is more environmentally sensitive since each case is considered on its own merits.

There are various standards being applied in different countries - South Africa uses the 'Best Practicable Means' (BPM) measure, while 'Best Practicable Environmental Option' (BPEO) and 'Best Available Technology Not Entailing Excessive Cost' (BATNEEC) have been used by other countries.

BPM is aimed primarily at the prevention of pollution, and the conversion of harmful substances unavoidably produced to the most harmless possible form. All relevant factors including waste generation must be considered when producing a product, but trade-offs are necessarily made, and these are left to individual discretion. The absence of a set ranking of factors means that the most environmentally acceptable course of action may not be followed even though BPM is being applied.

BPM has recently replaced BATNEEC, which is essentially the same as BPM, in the European Community. This was as a result of difficulties experienced with the determination of the "best available technology not entailing excessive cost" - what constitute excessive cost or best available technology differs

markedly depending on individual value judgements. The BPM option is less subjective.

Unfortunately, BPM as used in South Africa at present does not require the assessment of the total impact of the pollutant on the environment by controllers. For example, the effects on the atmosphere may be considered, but those on water and/or land ignored.

In South African legislation, BPM is defined in the Atmospheric Pollution Prevention Act, but not mentioned in the Water Act. A variety of standards have also been laid down in regulations and informal guidelines. It appears that a consistent standard is not being applied to all pollution media (air, land and water) in South Africa.

It has been recommended (CSIR, 1991, p 124) that the Best Practicable Environmental Option (BPEO) defined in the 12th report of the Royal Commission on Environmental Pollution be examined when uniform standards are decided on.

"A BPEO is the outcome of a systematic, consultative and decision making procedure which emphasises the protection of the environment across land, air and water. The BPEO procedure establishes, for a given set of objectives, the option that provides the most benefit or least damage to the environment as a whole, at acceptable cost in the long term as well as the short term."

The BPM/BATNEEC and BPEO standards are both included in the recent Environment Protection Bill in the United Kingdom, which adopts an Integrated Pollution Control approach. The pollution control authorities identify, and require companies to use, the environmental medium whereby waste generated by certain scheduled processes is to be disposed. These developments should be taken into account when determining environmental

standards in this country, especially due to the seeming influence of English law on South African law.

3.4 Recent Legal Developments

3.4.1 General

Recent developments in environmental law in South Africa include the following:

In 1977, a Commission of Enquiry was set up specifically to investigate a bill on the disposal of containers reported on waste control in general. The Government White Paper on a National Policy Regarding Environmental Conservation was issued in 1980. A recommendation made in this paper is that conservation and development should be balanced. The Environment Conservation Act (Act 100 of 1982) was the first national statute aimed at conservation. In terms of this Act, a statutory advisory body of environmental experts, the Council for the Environment, was established. This Council issued various reports during the 1980s.

As these measures did not result in effective pollution control, even though the Environment Conservation Act was amended in 1989, the President's Council was commissioned in 1990 to investigate a policy for a National Environmental Management System. This report was published in 1991.

These developments will be further discussed in terms of the three-fold definition of environmental law suggested by Glazewski (1991b, p14). A list of selected statutes and provincial ordinances grouped according to that three-fold categorisation may be found at Appendix A.

3.4.2 Resource Conservation and Management

The concept of sustainable growth is of paramount importance where the management and conservation of resources is concerned. Where resources are non-renewable, or a process is irreversible, special care must be taken to ensure that vital resources are not exhausted, or untreatable or undesirable forms of waste arbitrarily produced. The notion of inter-generational equity is also important in this regard - most of the present resource use patterns tend to assume that the present generation is more important than future ones, although there is no basis in law (or any other area) for this assumption. These concepts were explored further in the environmental economics chapter.

3.4.3 Land-use Planning and Spatial Development

When determining the use to which land should be put, and any redistributional aspects that may be involved, environmental factors should be given due consideration. Although the Government White Paper (1980) made some progress in this regard, it did not consider the concept of sustainable use. The ecological worth of the land, and its resulting most appropriate use, are generally ignored. This could mean that unique environmentally sensitive areas are used for purposes to which they are not suited.

A means of controlling pollution in this area is that of Environmental Impact Assessments. These are required by statute in various overseas countries, particularly the United States, the European Community and Australia, but are performed voluntarily and on an ad-hoc basis in South Africa. This concept has recently been widened to Integrated Environmental Management in South Africa, and is applied in practice by companies such as Eskom. Although the Minister of Environmental Affairs has the power in terms of the Environment Conservation Act (73 of 1989) to make Environmental Impact Assessments mandatory, he has not exercised this power. It appears that he is unlikely to do so, since the prior agreement of other Ministers, including the Ministers of Defence, "Mineral Affairs" and Energy, must be obtained. Since these "senior" Ministers are all responsible for control of highly polluting industries, the

"junior" Minister of the Environment does not appear to have the actual authority to exercise this power in practice.

3.4.4 Pollution Control and Waste Management

3.4.4.1 Environment Conservation Act (73 of 1989)

The Environment Conservation Act (73 of 1989) does not have a policy statement regarding the environment, although the draft Bill contained the following policy which is similar to an environmental bill of rights:

"National Policy for Environmental Conservation.
Statement of principles.

This Act shall be interpreted and implemented so as to advance and uphold the following principles:

(a) Every inhabitant of the Republic of South Africa is entitled to live, work and relax in a safe, productive, healthy and aesthetically and culturally acceptable environment.

(b) Every human generation has a moral responsibility to act as trustee of its natural environment and its cultural heritage in the interests of succeeding generations.

(c) Every person or institution has an obligation to consider carefully all activities which may have an influence on the environment and to take all practical measures to ensure the protection, maintenance and improvement of both the natural and the man-made environment.

(d) The preservation of natural systems and the processes is essential for the meaningful survival of all life on earth.

(e) Living natural resources are renewable, and can be utilised indefinitely with discretion, while non-living natural resources are finite and their utilisation can only be extended by judicious use and maximal re-use.

(f) Co-ordinated and purposeful research is essential to gain and apply knowledge of all the facets of the environment and the interaction between man and environment, in order to reconcile provision for the reasonable needs of man with effective protection of the environment.

(g) Comprehensive and sustained tuition and interpretation and dissemination of information is essential for the establishment of rational utilisation of the environment."

Another provision in the Bill provided that "All other laws shall be interpreted and administered in accordance with the principles and policy contained in this Act" (Section 3(3) of the Bill, Government Gazette 11013 of 30 October 1987). This provision, and the environmental policy quoted above, were not incorporated into the final Act. Instead the Minister was granted the discretion to decide on an environmental policy.

The main problem associated with the effectiveness of the Environment Conservation Act is the general reluctance of the Minister to exercise his discretionary power. This has not been done in the following areas: the establishment of a statutory environmental policy as discussed above; environmental impact assessments for "affected areas" for which approval by other Ministers must be obtained, and fundamental regulations have not been passed; and the setting up of a Board of Investigation, which would allow the public a greater say in environmental issues appearing before the courts. It has been suggested (Glazewski, 1991b) that this could be a first step towards the establishment of an environmental court.

Administrative law problems frequently encountered by lawyers are also dealt with in the Act. However, these provisions only apply to administrative body decisions made in terms of the Act, and not to general environmental statutes. They have, in fact, not been used in practice.

The two most significant provisions are firstly that interested persons affected by decisions may request reasons for those decisions, and those reasons shall be supplied to them; and secondly, the "locus standi" requirement is relaxed for conservation bodies wanting to take environmental matters to court.

The Act is an improvement on its predecessor, but is of limited application, partly due to the Minister having unused discretionary powers and partly to the low ranking of the Department of the Environment in relation to other government departments.

3.4.4.2 CSIR Report (1991)

In 1990 the CSIR was commissioned by the Department of the Environment to prepare a report on "Pollution Control and Waste Management in South Africa". The report was published in January 1991. The major finding was that control of pollution and waste management was extremely fragmented. There are about 40 national statutes governing the disposal of solid waste alone. In addition, government departments involved with pollution control have responsibility for monitoring only part of a pollution aspect of air, land or water.

Perhaps the most significant example of this fragmentation of control is in the area of water pollution. Pollution of water courses and point source pollution (e.g. by pipelines) of the marine environment is monitored by the Department of Water Affairs. The Department of Transport is responsible for monitoring pollution of harbours, as well as the marine environment from oil discharges by ships at sea; once a spill has occurred and oil reaches the sea or coastline, the Department of Environmental Affairs takes over. In addition, any pollution governed by the Atmospheric Pollution Prevention Act and the Hazardous Substances Act is monitored by the Department of National Health and Population Development; and any aspect of pollution governed by any International Convention to which South Africa is a signatory is handled by the Department of Foreign Affairs.

As a result of this fragmentation, control of the environment is simply not being achieved. The Department of Water Affairs is by far the most effective in their monitoring role, partly because they employ a team of lawyers which enables the prosecution of offenders. Other departments, however, have not made any prosecutions. Thus a polluter could easily change from water to atmospheric pollution without incurring fines he would have incurred if water pollution had continued. The overall pollution performance of an individual is not considered.

In addition to statutes, there are a large number of provincial ordinances and by-laws, with control at the "pollution face" being monitored by local authorities. This is partly due to staffing shortages being experienced by various Government Departments responsible for pollution control, which then delegate to local authorities.

The following waste statistics published in the Executive Summary of the CSIR report highlight the seriousness of the problem:

- One South African power station, Lethabo, will produce more fly ash than the whole of France on completion;
- South Africa releases 145-million tons of air pollutants annually;
- Approximately 1,3-million tons of packaging waste is discarded annually. Of this, litter amounts to 200,000 tons, and this costs R80-million to remove;
- Overall, only 23% of South Africa's paper, plastic, tin, aluminium and glass is recycled.

Legislation for land-based waste is "confused and overlapping" and needs serious attention. However, the legislation governing air pollution is tighter, but the report suggests that the Health Department is not the appropriate body of control as the entire environment can be affected, not just human health.

The report also states that "(t)he legislation and administration of waste management and pollution has lost sight of the need to maintain a holistic outlook on pollution regulation". Furthermore, low fines are also inappropriate in light of the environmental damage caused by polluters. Fines for first offenders range from R10,000 under the Water Act to a mere R500 for breaking air regulations.

The CSIR report has highlighted the fragmentation of control over the environment, as well as the lenient attitude towards most polluters in South Africa.

3.4.4.3 International Conventions

On the global front, South Africa is a signatory to about 20 international conventions. Among these are the 1985 Vienna Convention for the Protection of the Ozone Layer and the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer. It is also considering whether to accede to the 1989 Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. See Lyster (1985) for further examples of international conventions.

3.4.4.4 President's Council Report

The President's Council Report, which was issued in 1991, made recommendations in regard to a National Environment Management System, with particular reference to the ecological, economic, social and legal implications thereof. The Report recommended a single central government agency to enforce, monitor and administer environmental laws.

The report discussed various aspects of the environment, namely land and soil, water, the atmosphere, living resources and waste. Detailed recommendations for the control of these aspects were made. For example, an annual audit of water resources should be conducted by the Environmental Council as part of the "State of the South African Environment Report". This report would be submitted to the Minister of the Environment, and tabled in Parliament. Other Governments required to prepare such reports are Canada, Portugal and New Zealand.

The Report also considered economic aspects of environmental management, such as taxes, subsidies and marketable pollution permits. It was suggested that subsidies "should be seen as a temporary measure to smooth the

adjustment to a system in which the polluter is made to pay for his use of the waste-assimilative capacity of the environment". The marketable pollution permits were considered the most effective instrument of control.

Statutes governing the environment were discussed, and changes recommended. Specifically, the Minister should only be required to consult with other Ministers, rather than obtain their approval regarding any exercise of his discretionary powers, especially as regards the declaration of an environmental policy. Integrated Environmental Management (IEM) should become legally enforceable by means of modifying statutes. Furthermore, "locus standi" should be re-defined in the area of environmental issues, and the re-definition legislated since the courts would probably not do so otherwise. An environmental appeal tribunal would enable the independent assessment of whether public interest was adequately considered by the courts. This would enable appeals to be made on non-administrative grounds, the only type of appeal currently possible.

Further recommendations are that environmental constitutional rights should be considered, criminal sanctions should be applied as a subsidiary rather than a primary sanction, a standing environmental law reform body should be established, and South Africa should become a signatory to international conventions it has not yet become a party to. Details of the latter can be found in Annexures A and B to the Report.

3.5 Future Developments

3.5.1 Constitutional Changes

With the rate of the current political changes being experienced in South Africa, it seems highly probable that the new constitution will contain an environmental clause. Many countries have included such clauses in their constitutions, the latest being Namibia (Glazewski, 1991a). Environmental rights are difficult to define, and unless defined clearly, any environmental

clause in a constitution will be unenforceable by courts of law in certain circumstances. An interesting case is that of the Indian constitution, in which private and political rights are laid down, with environmental and socio-economic rights included as Directive Principles of State Policy. The State is thus forced to consider the environment, and Indian courts have used those principles to support decisions in favour of environmental protection, even though the Principles contain a clause stating that they shall not be enforceable by the courts. It seems that an environmental norm, rather than a right, is being enforced.

Significantly, the Constitutional Committee of the African National Congress released "A Bill of Rights for a New South Africa" in November 1990. Article 12 deals with environmental rights and is reproduced below:

"Article 12. Environmental Rights.

1. The environment, including the land, the waters and the sky, are the common heritage of the people of South Africa and of all humanity.

2. All men and women shall have the right to a healthy and ecologically balanced environment and the duty to defend it.

3. In order to secure this right, the state, acting through appropriate agencies and organs shall conserve, protect and improve the environment, and in particular:

(i) prevent and control pollution of the air and waters and degradation and erosion of the soil;
(ii) have regard in local, regional and national planning to the maintenance or creation of balanced ecological and biological areas and to the prevention or minimising of harmful effects on the environment;
(iii) promote the rational use of natural resources, safeguarding their capacity for renewal and ecological stability;
(iv) ensure that long-term damage is not done to the environment by industrial or other forms of waste;
(v) maintain, create and develop natural reserves, parks and recreational areas and classify and protect other sites and landscapes so as to ensure the protection of areas of outstanding cultural, historic and national interest.

4. Legislation shall provide for co-operation between the state, non-governmental organisations, local communities and individuals in seeking to improve the environment and encourage ecologically sensible habits in daily life.

5. The law shall provide for appropriate penalties and reparation in the case of any direct and serious damage caused to the environment, and permit the interdiction by any interested person or by any agency established for the purpose of protecting the environment, of any public or private activity or undertaking which manifestly and unreasonably causes or threatens to cause irreparable damage to the environment."

This article contains three important and desirable factors: an environmental human right, an obligation on the State to protect the environment, and an obligation on individuals to defend the environment. Whether these clauses will be practical will depend on the framework and means of implementing statutory provisions decided on.

The Pan African Congress and Inkatha have also developed environmental policies. These are not as detailed as those of the ANC, and are outlined in the Financial Mail Survey dated 15 May 1992.

3.6 Conclusion

While it appears that at present environmental legislation does not adequately protect either the environment or the public of South Africa from widespread pollution, it is encouraging that the form and content of this legislation are receiving attention. The recommendations contained in the President's Council Report are particularly encouraging. Unless, however, particular care is taken to ensure the efficient application of any new legislation, South African environmental law will probably remain largely toothless.

CHAPTER 4: ENVIRONMENTAL REPORTING

4.1 Environmental issues and the conceptual framework 48

4.2 Demand for environmental reporting 50

4.2.1 Potential users and their needs 50

4.2.2 Market reaction to social disclosures 51

4.3 Social reporting background 54

4.3.1 Social issues and the historical basis of accounting 55

4.3.2 Accountability 56

4.3.3 Need for an environmental reporting model 57

4.4 Approaches to environmental reporting 58

4.4.1 Non-financial information 58

4.4.1.1 Narrative disclosure 58

4.4.1.2 Compliance with standards 60

4.4.1.3 Statistical summaries 62

4.4.1.4 Other means of reporting non-financial environmental information 62

4.4.2 Financial Information 62

4.4.2.1 Additional accounts 63

4.4.2.2 Social income statements 65

4.4.2.3 Associated Monetary Measurement Problems 70

4.5 Compliance with standards - the most suitable environmental reporting model 73

4.5 Conclusion 76

4.1 Environmental issues and the conceptual framework

The Financial Accounting Standards Board (FASB) initiated a conceptual framework project in order to develop a more rigorous approach to accounting standard setting, and to increase financial statement users' confidence in, and understanding of, financial reporting. This project was described as follows:

"A conceptual framework is a constitution, a coherent system of interrelated objectives that can lead to consistent standards and that prescribes the nature, function and limits of financial accounting and financial statements. The objectives identify the goals and the purposes of accounting - concepts that guide the selection of events to be accounted for, the measurement of those events, and the means of summarising and communicating to interested parties. Concepts of that type are fundamental in the sense that other concepts flow from them and repeated references to them will be necessary in establishing, interpreting, and applying accounting and reporting standards." (FASB, 1976).

Similarly, the objective of the South African conceptual framework, AC 000, is to provide information about the financial position, performance, and changes in financial position of an enterprise useful to a variety of users in making economic decisions. The financial information generally presented relates to past events, since the accounting system is based on historical cost, and non-financial information is not necessarily provided. Furthermore, financial statements reflect the result of stewardship of management, that is, their accountability for the management of resources made available to management.

This objective is, however, limited to financial effects and stewardship of financial resources. Social accountability, including accountability in respect of natural resources, does not fall within the scope of the conceptual framework. In order for meaningful economic decisions to be made, the knowledge of the environmental record of a company may prove vital.

For example, an American company, Occidental Chemical Corporation, acquired Hooker Chemical Company, and years later were faced with a massive environmental problem when they had to compensate victims of dumping as well as rehabilitate the dump site at enormous cost. Had information about the

scale of the dumping of toxic chemicals, and the potential environmental damage, been available at the time of purchase, Occidental may not have acquired Hooker Chemicals at the agreed price, if at all.

Suggestions for determining a social reporting conceptual framework have therefore been made. Ramanathan (1976) extended some of Churchill's (1974) ideas, and defined social accounting as

"the process of selecting firm-level social performance variables, measures and measurement procedures; systematically developing information useful for evaluating the firm's social performance; and communicating such information to concerned social groups, both within and outside the firm".

Objectives for, and concepts of, social accounting were also proposed. The following objectives were suggested (Ramanathan, 1976):

- "to identify and measure the periodic net social contribution of an individual firm
- to help determine whether an individual firm's strategies and practices which directly affect the relative resource and power status of individuals, communities, social segments and generations are consistent with widely shared social priorities on the one hand and individuals' legitimate aspirations on the other.
- to make available in an optimal manner, to all social constituents, relevant information on a firm's goals, policies, programs, performance and contributions to social goals."

Implicit in this framework is the monetarisation of each social transaction, as expressed by the first objective. Since monetarisation is an inherently subjective process, the first objective would appear to be inappropriate for a social reporting model (refer 4.4.2.3 for further discussion). The remaining objectives should probably form the goals of most social reporting models.

4.2 Demand for environmental reporting

4.2.1 Potential users and their needs

The traditional users of company financial statements are shareholders, creditors (long- and short-term), analysts serving the above, non-executive directors, government departments and ministers, regulatory agencies, other companies, and standard setters/ academic researchers. Other, non-traditional users are employees, customers, suppliers, industry groups, labour unions, and the public. (Belkaoui, 1985). It is interesting to note that environment-specific users are not included in this list of potential users, unless the general public can be regarded as inclusive of all categories of users not specifically mentioned.

Various user needs have also been listed, including the following which could be regarded as inclusive of environmental issues: estimating future prospects, aiding resource allocation, assessing adaptability, determining compliance with the law or regulations, and assessing contribution to society. It was further noted (Belkaoui, 1985) that the informational needs of users is difficult to determine, since different users make use of different decision models.

Various studies have been performed in order to determine the nature of user needs. For example, the information needs of university investors and mutual fund managers was considered by Buzby and Falk (1979a and b). Schreuder (1981) considered the information requirements of employees.

In a further attempt to identify information needs, Dierkes and Antal (1985) conducted a survey of shareholders and considered indicators for various activist groups. It was found, as may be expected, that the usefulness of specific information varies per target (or user) group. Thus the informational needs of investors differ from those of the "green" consumer, for example. In a subsequent paper, Dierkes and Antal (1986) discussed the possibility of legislating social reporting as a means of providing information to a broader base of user than the traditional investor alone.

Rockness and Williams (1988) discovered that managers of social responsibility mutual funds use similar means of evaluating a company's social responsibility. No single method was used by all managers surveyed, however. Furthermore, they argue that consideration should be given to public disclosure of information already produced for limited distribution. The cost of publishing this information would be relatively low, since it would be readily available to corporate management.

Rubenstein (1991) outlined the information requirements or needs of the "invisible" stakeholders. The four categories of users (other than the traditional investors) are "green" consumers, environmental activists, employees and communities in the impact zone. The information needs of each of these users in respect of each of the past, present and future obligations of the company are set out - refer to Appendix B. This categorisation appears to highlight all possible "environmental" users.

That social responsibility information is in fact used by investors was established in a study based on the Sullivan Principle signings by American companies (Patten, 1990).

4.2.2 Market reaction to social disclosures

In recent years, some studies concerned with the impact of social disclosures on the market have been conducted. Anderson and Frankle (1980) found that social disclosures do have information content, and that the market values these disclosures positively. However, they noted that only favourable disclosures were made, generally by large firms.

Studies investigating the effect of pollution disclosures on the market have been performed. The first of these was Belkaoui (1976), a paper which assessed the impact of pollution control expenditures on the stock market. Assuming that the semi-strong form of the efficient market hypothesis holds, disclosures were found to have a large but temporary effect on the share price. The worst

environmental offenders, however, did not appear to be rewarded by the stock market. This seems to imply that users of published financial information were generally aware of the environmental performance of the companies concerned, irrespective of any disclosures made.

Spicer (1978) compared pollution control to the following indicators of investment value: profitability, company size, total risk, systematic risk and the price earnings ratio. The existence of significant associations was noted, but as in Belkaoui (1976) these were found to reduce over time. Spicer concluded that corporate social performance was consistent with investor perceptions based on the information disclosed by the firm.

Ingram (1978) discovered that the information content of disclosures varies across firms, and that if segments are combined, the effects of social responsibility disclosures on security returns were diluted. The information content of the disclosures was found to be conditional upon the particular market segment concerned. Ingram and Frazier (1980) found a weak association between quantitative measures of disclosure content and independent measures of social performance. Wiseman (1982) found, however, that such an association in the case of environmental disclosures did not exist.

Other studies concerned with social responsibility disclosures and market effects thereof are Jaggi and Freedman (1982), Trotman and Bradley (1981) and Chugh et al (1978).

The first study to evaluate the effects of environmental information produced outside the firm on the market was performed by Shane and Spicer (1983). They set out to prove that price movements were consistent with changes in investor perceptions when external Council on Economic Priorities environmental reports were issued. Share price movements around the time of the release of external reports were found to be consistent with changes in

investor perceptions of probable cash flows at the date of the release of the report. Furthermore, such movements were consistent with investors using information to distinguish between companies with different pollution control records.

The long-term market response to pollution control expenditure was considered by Mahapatra (1984). The 'ethical investor' versus the 'rational economic investor' were considered. An analysis of profitability, systematic risk and cash position effects revealed that the rational economic investor was predominant. Therefore pollution control expenses were seen by investors to be a drain on a company's resources, with environmental protection efforts being unrewarded.

Whether the extensiveness of pollution disclosures in annual financial statements affects investors' decisions was considered by Freedman and Jaggi (1986). Abnormal returns of firms selected from highly polluting industries with extensive disclosures were compared with those with minimal disclosures. No significant differences were found, that is, extensiveness does not necessarily provide incremental information.

Cooper (1988) criticised Freedman and Jaggi's (F&J's) approach by examining various conflicts inherent in their arguments. F&J base their theory on one investor reaction, namely that of the minimisation of legislation. Specifically, investors may regard legislated disclosure designed to encourage reductions in emissions by companies as detrimental to their interests. However, Cooper claims that there are four possible investor attitudes. In addition, their positive approach is criticised for its assumed neutrality. Accounting reports are not an impartial set of calculations, or a neutral arbiter for any decision maker. Although this argument appears to hold water, any further expansion is beyond the scope of this dissertation, and F&J (1988b) adequately defended their study against these criticisms.

Haw and Ro (1988) also criticised F&J's approach. The weighting of the disclosed items appeared somewhat arbitrary, in that the nature of the pollution was ignored. In addition, quantification does not necessarily indicate a greater level of corporate concern. Furthermore, no pure control group was used, and differing factors such as firm size, earnings performance or risk were not controlled. The market reaction to pollution disclosure was in no way isolated from the general market reaction to other firm-specific information released at the same time. Haw and Ro concluded that F&J's tests were probably not powerful enough to support their conclusions.

Freedman and Jaggi replied to the criticisms made by Haw and Ro (1988) in a paper in 1988, and demonstrated that their study stood up to the above criticisms (for their detailed arguments refer to Freedman and Jaggi (1988b)).

They argued that Haw and Ro's criticisms regarding the hypothesis were of a general nature, which could apply to any study on investor's reaction to disclosure of information in annual financial statements. Furthermore, relative index weightings can always be challenged. Freedman and Jaggi argued that the weighting used in their study was sound and reliable, because an equally weighted index did not yield significantly different results. As far as possible, factors such as firm size, risk and earnings performance were adjusted for. Some factors were isolated by determining whether there were any other significant events (for example, mergers or earnings announcements) affecting the company during the test period. Firms associated with significant events were excluded form the study. The impact of firm size could not be isolated due to the small sample size, and risk was controlled in the study by way of the C_{it} factor.

Based on the above discussion, social responsibility, and hence environmental, disclosures **are** used by investors, and do have an impact on the market.

4.3 Social reporting background

4.3.1 Social issues and the historical basis of accounting

Financial accounting traditionally focuses on the transactions between two or more entities. As a result, any impacts on the social environment are usually ignored (Belkaoui, 1985). Increasing public awareness of the harmful effects of pollution on the environment has, however, resulted in the general public becoming more assertive, and demanding to be informed of social impacts of businesses, not just in the traditional accounting sense.

In South Africa to date, businesses have operated mainly on the "need to know" basis, supplying information only where required to do so by law, or in an attempt to improve their image. For example, a manufacturer would only disclose costs relating to restoration of environmental damage after a major pollution disaster had been widely publicised in the national media. Suitable disclosures would then be made in an attempt to recover some degree of credibility in the eyes of investors, creditors and the general public. A case in point being Sappi Limited's 1992 annual financial statements, which contained limited references to environmental issues, despite extensive disclosures being made in the 1991 financial statements after major spills into local rivers (see section 7.5.12).

Well-publicised environmental damage and disasters such as the Exxon Valdez oil spill and holes in the ozone layer have highlighted the traditional accounting process's inability to deal with the environmental impacts of business. In fact, it has been argued that accounting confirms the place of neo-classical economics (Maunders and Burritt, 1991). Accounting also appears to have a vested interest in down-playing ecological impacts. Maunders and Burritt examined the case of land degradation in Australia, and concluded that traditional accounting reporting resulted in misinformation and hence misguided decisions in that case.

Maunders and Burritt (1991) also argued that the fundamental bases of accounting, namely going concern, matching, prudence and consistency, are inappropriate for environmental issues. This was also considered by Wainman (1991), who criticised most attempts at reforming the present accounting process on the basis that these attempts all build on the traditional 16th century system of accounting, and hence the original limitations inherent in the system remain. This is supported by Rubenstein's (1991) analysis of the differences between traditional and environmental obligations. Refer to Appendix C for this analysis.

4.3.2 Accountability

The traditional accounting process is also based on the assumption that corporations are accountable to their shareholders for their financial performance. Profit maximisation is in general the primary goal of any corporation. Managers are generally reluctant to adopt any policy which would adversely affect their "bottom line". This self-interested approach (Watts and Zimmerman, 1978) does not take the interests of other "invisible" shareholders into account.

Profit maximisation is acceptable, provided that the interests of society in general are also respected. From this flows the argument that corporations should be held accountable for their stewardship of natural resources (Rubenstein, 1991; Selley, 1991; and Gray, 1990a among others). This accountability is due to, inter alia, the increased level of concern for the environment visible in the proliferation of "green" products, environmental pressure groups such as Greenpeace, as well as major political parties having some form of environmental policy.

Williams (1980) used a sociological approach to argue in support of the social accountability of corporations. Any accountability relationship necessarily requires a social expectation, together with both communication of that expectation to corporations, and an obligation on the part of corporations to

fulfill the expectation. Unless these requirements are present in a social relationship, accountability will not be enforceable. Burchell et al (1980), Gray et al (1988), Gray (1991, 1992), and Maunders and Burritt (1991) also argued in favour of greater accountability of corporations to society. Benston (1982) argued against social responsibility accounting, on the ground that the estimation of costs imposed by externalities was not reliable, and these measurements should not be included in the annual report. Whilst this appears to be a valid objection, Benston assumes that social accounting necessarily involves the monetary estimation of social costs and benefits, and hence his comments should be interpreted in the light of this assumption as being an argument against monetarisation, rather than against corporate social reporting.

Accountability would result in the polluter having to bear a greater, if not complete, portion of the cleanup costs necessitated by their production processes and/or products. This potential increase in costs that would be borne by a polluter has in many instances resulted in strong resistance to any change to the status quo.

4.3.3 Need for an environmental reporting model

In spite of the general reluctance of corporations to report environmentally related information, it has been recognised to varying extents that the demands of various non-traditional users should be met in some way. The Corporate Report (1975) examined the scope and aims of published financial reports in the light of modern needs and conditions, and examined the public accountability of economic entities. Their major findings included the recommendation that financial statements should attempt to satisfy the informational needs of their users. The Corporate Report expresses a need for statements of disclosure that can be used to improve the social and economic welfare of society.

Disclosures of environmental information in annual financial statements, the traditional vehicle of communication between a company and interested parties, are, although presently minimal, gradually becoming more common-place.

These disclosures appear to be, however, ad hoc and their extent and genuineness are generally extremely difficult to evaluate. For this reason, various attempts have been made to formulate possible reporting models, so that some degree of comparability between corporations may be attained. Some of these attempts are discussed below.

4.4 Approaches to environmental reporting

Social reporting can be divided into two broad categories of information, namely financial and non-financial information. This section begins with a discussion of non-financial information.

4.4.1 Non-financial information

4.4.1.1 Narrative disclosure

Information ranging from very general corporate goals to relatively detailed analyses of specific issues to glossy photographs can be disclosed in narrative form. Advantages of this method are the ease of preparation, as well as low time and cost inputs. Although these disclosures could include monetary amounts, they are, in general, of a nonquantitative nature. They have been observed in both report format, and in footnotes to company accounts (Gray, Owen and Maunders, 1987).

Among the first to consider narrative disclosures was the American Accounting Association (AAA) in 1973. They suggested that the report should identify environmental problems, specify abatement goals and company progress towards meeting those goals, and disclose all material financial effects on the company's present and future financial position, earnings and business activities.

Environment-related information which could be disclosed includes:

- expected future outlays for environmental damage caused by past and present production processes;
- legal liabilities due to the violation of existing legislation;
- contingent liabilities due to probable violation of present or pending legislation;
- liabilities for expected future outlays that will not result in the creation of an asset value for the firm;
- liabilities for eventual land restoration after strip or open cast mining;
- extraordinary items; and
- pollution facilities (for example, state-of-the-art technology, abatement equipment, waste disposal facilities).

Perhaps the American Accounting Association's most significant contribution was to advocate the independent attestation of the environmental reports. This suggestion has not been widely followed, in spite of subsequent generally widespread disclosure of narrative information by American companies. The Ernst and Ernst (1978, 1979) surveys of Fortune 500 (USA) companies showed that 90% had some form of social disclosure by 1979, though this was usually brief in relation to the whole annual report.

Other studies have been conducted in order to assess the extent of disclosures in company reports. Brockhoff (1979) found that 70% of German companies disclosed explicit social information, generally in broad narrative terms. However, environmental protection related information was found to be of an heterogenous nature, with widely differing definitions of "total expenditure" being applied. In addition, no negative disclosures of any kind were made. All disclosures were apparently made in an attempt to improve the public image of the discloser.

A study of Indian companies (Singh and Ahuja, 1983) found that nearly all had some form of social disclosure, irrespective of firm size. Similarly, in the

United Kingdom, it appears that over one third of the larger companies have some social disclosure. No separate mention was made of pollution disclosures, however (Miltz, 1992).

4.4.1.2 Compliance with standards

The primary advantage of reporting information and comparing it with standards is that inter-company comparisons can be facilitated. Narrative disclosures are often extremely subjective, making meaningful and objective comparisons virtually impossible.

Corcoran and Leineger (1970) proposed the use of environmental exchange reports in which inputs and outputs, in terms of human and physical resources, would be disclosed. The outputs included discussion of the type and amount of effluents released into the surrounding environment. Any fines or penalties due to the contravention of legislation would also be discussed here.

Marlin (1973) suggested that two types of pollution reports could be prepared. The first involves comparison of pollution controls with standards, determined by the best available (state-of-the-art) technology at the reporting date. The major limitation of using such state-of-the-art standards is that, although one can tell whether a company is doing all it can to combat pollution, the extent and seriousness of the pollution problem are not communicated.

Therefore a more appropriate report would involve the comparison of actual emissions with legal standards per pollution type. This approach concentrates on actual measures which are more reliable than state-of-the-art measures from an attestation point of view. However, additional information such as water flows and total production would need to be reported in order to facilitate the evaluation of the dilution of concentration of the emissions. This would provide the user with an indication of the assimilative capacity of the surrounding (local) environment. Examples of Marlin's reports are reproduced in Appendix D.

This approach is fairly flexible, since new areas of concern could be reported on as they arise. However, for widespread preparation of these reports to occur, standards for each industry and pollution type would have to be generally accepted. These reports would also not be prepared if the cost-benefit criterion underlying most business decisions were not met. This last point is debatable though, especially if compliance with standards is required in terms of legislation. Perhaps the most significant drawback of this approach is that overall evaluation of a company's pollution control is extremely difficult.

Marlin (1973) raised another limitation of his study - if environmental costs give rise to liabilities that are not recorded by the polluter, and environmental gains are included in income, this is clearly inconsistent since return on equity is increased regardless of the company's social performance.

Dilley and Weygandt (1973) extended Marlin's reports to cover other social areas such as health and employees using a cost outlay approach.

Some authors have argued either for or against standard setting in the area of social accounting. Parker (1986) and Baxter (1981) argued that standard setting is important in certain circumstances. Puxty (1986) criticised the view that implementing social accounting would result in increased legislation, introduced directly as a result of selected companies' voluntary dislosures.

Rockness, Schlachter and Rockness (1986) investigated the relationships between hazardous waste disposal, corporate disclosure and financial performance in the chemical industry. They found that minimal disclosures were made, usually where financial performance had been poor, almost as justification for poor performance. Their study provided support for advocates of increased mandatory environmental disclosures, and reports reflecting the extent of compliance with legal standards.

The question of legislation of corporate social reporting (CSR) was also considered by Dierkes and Antal (1986). They discussed various models for CSR, and argued for the implementation of mandatory CSR.

4.4.1.3 Statistical summaries

Statistical summaries are slightly more detailed than purely narrative disclosures, involving presentation of tables or summaries of categorised information, often accompanied by narrative disclosures. For example, the number of employees per payclass, together with salary ranges; or the physical quantities of effluent produced, per production process could be disclosed in tabular form. Statistical summaries seem, however, to have been used mainly in connection with reporting employee-related information (Gray, Owen and Maunders, 1987).

4.4.1.4 Other means of reporting non-financial environmental information

Any of the currently available means of providing information could be used - pictures, words, visual, and aural media included. Advertising and social reporting could easily overlap, but for advertising to be regarded as social reporting it would have to satisfy the accountability test. It could be argued that most of the advertisements reflect a self-congratulatory attitude, and seem to be aimed at promoting the corporate image.

4.4.2 Financial Information

Pollution-related financial information can be reported in income statement, balance sheet, or cash flow form. But the emphasis could shift from the reporting of actual historical cost figures to various measures of social cost. It will be demonstrated in section 4.4.2.3, however, that the latter are not practical. These reports can be prepared from the perspective of either the company or society, the latter arguably being the better approach from a social reporting point of view. A desirable goal or characteristic of these statements is that they should make a socially responsible company look better than their irresponsible competitors on the "bottom line" (Gray, Owen and Maunders,

1987). This could overcome the self-interest barrier to social, and in particular environmental, disclosures. But this goal may prove extremely difficult to achieve.

Financial information can also be used to support general narrative disclosures made elsewhere in the annual report. However, the information should be relevant and relatively reliable, and useful to management and investors alike (Perks and Gray, 1979; AC 000). Other categories of users have been suggested (refer section 4.2.1 above), and these categories impact on the type of reports to be prepared, as well as the usefulness of any information provided.

4.4.2.1 Additional accounts

Beams (1970) suggested accounting procedures to provide for industrial site deterioration caused by pollution. Any deterioration of the industrial site during the current reporting period would be debited to an Industrial Site Deterioration account, with the corresponding credit to the Allowance for Industrial Site Deterioration account. This would be relevant in the cases of air and water pollution, and industrial waste accumulation.

The allowance account is a contra-asset account, which would be set off against the Fixed Property account. Current outlays on pollution control and waste disposal should then be charged to a maintenance account, rather than the deterioration account. This would enable separate evaluation of deterioration and pollution control. Both the maintenance and deterioration charges are necessary costs incurred during the production process (consistent with the laws of thermodynamics) and should therefore be allocated to the cost of production.

This method appears appropriate for industries in which the condition of the atmosphere, soil, land surface and still water are important. Examples would be businesses in agriculture, strip mining and resource development. The method is, however, inappropriate in the case of running water due to the

difficulty of assessing a company's share of the overall deterioration of moving water. An advantage of this approach is that a liability for future pollution-control outlays is raised. It is, however, debatable whether penalties or future voluntary restoration costs should be treated as liabilities, or as commitments for capital expenditure. There is thus some latitude for management choice of the method to be adopted, and the comparability of reports could be impaired.

Gray (1992) suggested the use of non-financial accounts of the biosphere, a model which incorporates the concept of sustainable development. Current accounting techniques would be adapted as necessary. In fact, it has been suggested that it is highly probable that "no Western company has made a "sustainable" profit for a long time, if ever" (Gray, 1991). Although Gray discussed his approach, he did not provide any physical examples whereby one could evaluate his suggestions.

Practical examples were, however, given by Rubenstein (1991) in his discussion of the Occidental Chemical Corporation's cleanup of toxic waste dumped by a company they purchased, the Hooker Chemical Company.

The objective Rubenstein set was to develop a set of accounts that can provide some degree of measurement of a firm's ability to deliver goods and services after accounting for environmental costs in full. The name coined for this ability was "ecopreneurship".

The introduction of a natural asset trust account was suggested. This trust account would not be recorded in the company's books, but would be an independent record of the physical natural capital which would be separately disclosed in the annual financial report. This information would reflect a measure of the potential environmental liability of the company. Some of the information needs of the "invisible" shareholders would thus be met. Furthermore, in this way a record of environmental damage and cleanup costs

incurred could be kept, as well as an assessment of any potential future cleanup costs.

After the completion of cleanup activities, the natural asset account balance would remain constant, assuming no further dumping or degradation occurred.

Rubenstein suggested that had Hooker Chemical Company seriously considered the magnitude of the potential cleanup costs involved, they may have attempted to use or develop improved disposal methods.

4.4.2.2 Social income statements

Seidler (1973)

Seidler (1973) developed social income statements for both profit and non-profit companies. Net social profit or loss, representing the net contribution of the company to society, is obtained by respectively adding and subtracting external economies and diseconomies to the conventional accounting profit or loss figure.

The social income statement for the profit oriented corporation is reproduced below.

SOCIAL INCOME STATEMENT OF A PROFIT-SEEKING ORGANISATION:

Value added by production of the enterprise
+ Socially desirable outputs not sold (benefits)
    a. Job training
    b. Health improvement of workers
    c. Employment of disadvantaged minorities
    d. Others
– Socially desirable effects not paid for (costs)
    a. Air pollution
    b. Water pollution
    c. Health problems caused by company's products
    d. Others
Net social profit (or loss)

The profit and non-profit approaches are fairly similar, albeit very general. They do, however, involve the recognition of social costs and benefits not normally measured through market transactions. Where monetary measurement of such costs and benefits is impossible, rankings in order of "degree of damage", or some other appropriate ordering criterion, could be used. However, these statements are fairly brief, and would be more informative if a more detailed breakdown of social costs and benefits were given.

Solomons (1974)

Solomons (1974) suggested a similar statement of social income:

Statement of social income	**R**
Value added generated by production process	x
Add unappropriable benefits	x
Less external costs imposed on community	x
Net social profit/loss	x

Seidler (1973) and Solomons (1974) provided an "ideal" measure of corporate social performance. There are major measurement problems associated with their approaches, however, since the assignment of monetary values to unappropriable benefits and external costs imposed on the community is extremely subjective.

Linowes (1972a)

Linowes (1972a) developed a socio-economic operating statement aimed at reporting the total social performance of a firm by means of generating a single monetary result.

The report, which would be prepared internally, shows improvements less detriments for the categories: people, environment and product. Improvements are costs incurred voluntarily by the company, while detriments are necessary

costs (from a legal perspective) which have been avoided by the company. These net improvements/deficits (improvements less detriments) are added to obtain the total socio-economic deficit for the year. The cumulative socio-economic improvement/deficit is also computed.

This socio-economic operating statement is in effect an re-phrasing of Seidler's and Solomons' approaches. However, Linowes also suggested that a "statement of funds flow for socially relevant activities" should be produced. This statement would be separate from the traditional funds flow statement. It could be argued, however, that the incorporation of environmental costs into the usual funds flow statement would also suffice.

Although this approach results in a socially responsible company looking better on the "bottom line", it is still fairly subjective.

Dilley and Weygandt (1973)

Dilley and Weygandt (1973) suggested a comprehensive reporting approach in which a different report is prepared for each socially relevant aspect of a company's business activities. Their examples included a social funds flow statement, an emissions statement (in dollars) and resource demands statement, among others. The exact format of each report would depend on the industry in which a firm operates, but the basic formats, built upon costs incurred, can be followed by any firm. This approach, being cost-based, is another which ignores the value of social costs and benefits.

Note that disclosure of the dollar value of pollutant emissions is made. This is not as ideal as the disclosure of the physical quantities of emissions, since the assignment of monetary values to emissions may not be indicative of the extent of pollution the company is responsible for.

Estes (1976)

Estes' (1976) comprehensive social accounting model was the first to require preparation of social statements from society's point of view. He uses the discounting approach to valuing the social surplus or deficit S, where

$$S = \sum_{i=1}^{n} \sum_{t=1}^{\infty} B_i/(1+r)^t - \sum_{j=1}^{n} \sum_{t=1}^{\infty} C_j/(1+r)^t$$

and where B_i = ith social benefit

C_j = jth social cost

r = appropriate discount rate

t = time horizon in which cost or benefit is expected

Interestingly, the aspects of direct social impact of a company included in the model go beyond those general ones discussed before. For example, the social values of actions of the company's board of directors and/or shareholders, and of employees' actions while on duty, are included in the model. Indirect effects, for example secondary pollution caused by users making use of the company's products, are ignored. If indirect effects were included this would result in double-counting, since the statements of both the producer and the user would be prepared from society's perspective. In addition, downward adjustments for producing goods which pollute (i.e. have indirect effects) should not be made, since the responsibility for such pollution rests on the user, not the producer.

Estes also stipulates that costs should not be netted against benefits, since separate disclosure of costs and benefits would provide greater insight into the company's overall environmental performance. A further bonus is that issues such as the replacement or substitution of resources for scarce or environmentally damaging resources, or social costs of white collar crime, could be dealt with as well.

The reporting format suggested by Estes (1976) is reproduced below.

The Progressive Company			
Social impact statement for the year ended 19x1			
Social benefits			
Products and services provided		$xxx	
Payments to other elements of society			
Employment provided	$xxx		
Payments for goods and other services	xxx		
Taxes paid	xxx		
Contributions	xxx		
Dividends and interest paid	xxx		
Loans and other payments	xxx	xxx	
Additional direct employee benefits		xxx	
Staff, equipment, and facility services donated		xxx	
Environmental improvements		xxx	
Other benefits		xxx	
Total social benefits			$xxx
Social costs			
Goods and materials acquired		$xxx	
Buildings and equipment purchased		xxx	
Labour and services used		xxx	
Discrimination			
In hiring (external)	$xxx		
In placement & promotion (internal)	xxx	xxx	
Work-related injuries and illness		xxx	
Public services and facilities used		xxx	
Other resources used		xxx	
Environmental damage			
Terrain damage	$xxx		
Air pollution	xxx		
Water pollution	xxx		
Noise pollution	xxx		
Solid waste	xxx		
Visual and aesthetic pollution	xxx		
Other environmental damage	xxx	xxx	
Payments from other elements of society			
Payments for goods and services provided	$xxx		
Additional capital investment	xxx		
Loans	xxx		
Other payments received	xxx	xxx	
Other costs		xxx	
Total social costs			xxx
Social surplus (deficit) for the year			$xxx
Accumulated social surplus (deficit) 19x0			xxx
Accumulated social surplus (deficit) 19x1			$xxx

The resulting report shows the value of all significant direct costs or benefits to society, and provides a picture by means of which the company's environmental performance can be evaluated from society's point of view. These reports can be used internally or externally, and satisfy a general requirement of management that the company should look better on the bottom line. Perhaps the most significant drawback to the model is that its very comprehensiveness means that all types of measurement problems will be encountered. In particular, the subjectivity associated with the estimation of B_i, C_j, r and t in the model is a major limitation of this approach. Thus, from a purely cost-benefit point of view, the method may prove impractical.

4.4.2.3 Associated Monetary Measurement Problems

The measurement problems associated with financial measures of social costs and benefits are unfortunately significant. Interdisciplinary and often ad hoc valuation techniques have to be used, as precise measurement is virtually impossible. This is due to the very nature of the items being measured - the value of pollution damage is heavily dependent on society's awareness levels, as well as the value system of the measurer.

For example, damage caused by a factory emitting large quantities of sulphur into the atmosphere would be valued differently in first and third world countries, simply because the factory would be providing a greater social benefit as regards employment and possibly foreign exchange in a third world country than a first world one. In particular, the potential impact on future generations, and hence the value placed on environmental damage, would be assessed differently in different societies.

Interestingly, it has been argued that first world countries, which introduced the technology which gave rise to the pollution problems commonplace today, should compensate the third world countries in order to enable them to convert existing facilities or acquire new ones so as to minimise production of pollutants. This, however, gives rise to all sorts of international problems as

regards pollution control, as well as income distribution, which are beyond the scope of this dissertation.

Various valuation tools in wide use by accountants can be adapted to the environmental case. The arguments both for and against the discounting of future cash flows still apply - estimation of a future stream of cash flows remains problematic, and the choice of an appropriate discount rate remains subjective - but the uncertainty attached to their estimation seems larger in the case of social costs and benefits than in the contexts of their current accepted use.

Ranking techniques could also be used. As with most capital budgeting decisions, or economic measures, a range of possible measures could be obtained, and this range used to evaluate the environmental acceptability or otherwise of a particular project.

Further measurement problems are raised by the depletability of otherwise of an economic good. How does one go about valuing an irreversible process or depletable resource where future generations would be saddled with either a huge harmful waste problem or the lack of a possibly vital resource? This is of particular concern at present, with, for example, the greenhouse effect and widespread deforestation combining to significantly impair the earth's ability to sustain life, both human and otherwise.

Attempts at developing alternative, or additional, appropriate measurement tools have been made, primarily by economists. However, the belief that if a problem is ignored, then it will go away, seems to be widely held in the case of environmental damage.

The "Macnamara Fallacy" highlights this view:

"The first step is to measure whatever can be easily measured. This is OK as far as it goes. The second step is to disregard that which can't be easily measured or give it an arbitrary quantitative value. This is artificial and misleading. The third step is to presume that what can't be measured easily

really isn't important. This is blindness. The fourth step is to say that what can't be easily measured really doesn't exist. This is suicide." (Yankelovich, 1972).

This is also an argument against producing social accounts or statements based on the financial valuation of non-market factors, as well as against taking the results of cost-benefit analysis seriously. Subjectivity remains the major problem associated with monetary valuations of social costs and benefits.

A further problem is that when numbers are assigned, those numbers seem to "carry the conviction of their accuracy" (Churchman, 1971). Kant theorised that if any principle is to be used for the purposes of measuring social change, then that principle should be universally applied. Where this is not the case, an unfair and immoral situation could arise. This is certainly the case for number assignment, which is based on strong value and reality assumptions. Thus the assignment of numbers to social changes should not be attempted.

Dilley and Weygandt (1973) discussed measurement issues, and suggested that the value of expenditures, as opposed to the amount expended, should be disclosed. However, such values are also extremely difficult to estimate.

A rather unique approach was considered by Huizing and Dekker (1992b), whereby the cost per kilogram of emissions is determined by means of chemical formulae. If **x** kilograms of A are emitted at a cost of **y** per kilogram, then the cost to society is **xy**. Refer to Huizing and Dekker (1992b, p454) for further details.

Although it appears from the preceding discussion that the measurement of social costs and benefits probably should not be attempted by accountants, Power (1992) argued that accounting is not sufficiently understood for its environmental potential to be summarily dismissed. Quantification is not outside the realm of the accountant - rather, accountants can help determine the limits of quantification. That these measurement issues are important is not

disputed, but the view that monetary reductionism is an axiom of accounting should be dismissed (Miltz, 1992).

4.5 Compliance with standards - the most suitable environmental reporting model

It has been demonstrated that the traditional historical cost basis of accounting does not cater for the social, and especially environmental, impacts of business. It was not designed to do so, since environmental damage was not an issue at that time. However, the needs of users, and the types of users themselves, have changed over time. Therefore a re-definition of assets and liabilities, to encompass environmental obligations and assets, should be considered. A mere extension or modification of these definitions would not achieve the desired effect - any weaknesses or flaws implicit in the traditional accounting model would remain inherent in the new model.

In an effort to address this issue, various alternative definitions have been suggested. One of these is that proposed by Rubenstein (1991):

"Accounting measures the resources consumed in producing goods and services for trade and for promoting public welfare, as well as the resources preserved, and wealth created for future use, in accordance with conventions mutually agreed on by both the stewards of these resources, and the stakeholders to whom they are accountable".

This definition is based in part on the sustainability concept, with the measurement of general resource use, not just the traditional use of monetary resources. It also stresses that unless the new accounting has the agreement of the user of the resource and the environmental stakeholders, the system may not have the desired effect. The consumption of resources can be interpreted as including environmental exploitation or pollution. The above definition should perhaps be extended to explicitly include these factors.

Agreement between users of resources and environmental stakeholders is unlikely to occur on a voluntary basis in the forseeable future, especially in a

country such as South Africa where social issues, such as providing equal health care and education for all, will probably take precedence over green issues which cannot make themselves heard. It appears that legislation or constitutional clauses may be the sole means of ensuring that "conventions" are applied to measuring environmental resources consumed or preserved, and that these are reported to all users of environmental information. This is supported by the view that, from an economic perspective, any system of environmental management necessarily involves the determination and enforcement of some form of environmental standards (refer to Chapter 2).

We have already seen that, due to the problems inherent in the monetary estimation of environmental costs, a purely monetarisation approach should not be advocated. Rather, the extent of compliance with legal environmental standards, together with actual levels of physical emissions, should be reported. The types of information to be reported include those items in the pollution abatement category of the index developed in section 6.4.

Furthermore, the White Paper on environmental management, issued by the South African government in 1993, recommends the phasing in of statutory environmental audits over a four year period, and that all new projects should only be approved after an environmental impact assessment. As a result, any costs of preparation of "compliance with standards" reports should be relatively small. Such information will be auditable, thereby increasing its credibility.

In addition to these compliance with standards reports, certain other information can reasonably be expected. Desirable disclosures should consist of at least the following:

- an environmental mission statement, or company policy;
- any cash costs actually incurred or expected. (These can be reported in the income statement, balance sheet and cash flow statement, and items should include current and planned capital expenditures on

environmental protection measures or equipment, and provisions for, or at least contingencies for litigation or cleanup costs.)

- accounting policies

Clearly a comprehensive list of desired disclosures cannot be blindly applied to all organisations - the applicability of each item on such a list is industry-dependent. However, disclosures should not be limited to such a list - organisations may, and should be encouraged to, provide further additional information. Therefore large variations in environmental disclosure can reasonably be expected. But certain levels of minimum disclosure should be developed.

The most effective means of setting out these disclosures in annual financial statements is in tabular form, with the volume of emissions together with related legal limits shown per type of pollution, per statute. This will enable readers to assess the status of an organisation's compliance or non-compliance at a glance. Also, areas in which action has been or will be taken would be highlighted for discussion. Any penalties incurred as a result of exceeding emissions standards should also be disclosed.

As far as the conceptual framework is concerned, the disclosure of a firm's compliance with legal environmental standards would ensure that basic relevant information is provided to social constituents as envisaged by the objectives of the social accounting conceptual framework (refer section 4.1). An organisation's strategies and practices may likewise be assessed against social priorities. Another factor, probably undesirable from a manufacturer's perspective, is that government-controlled environmental bodies will be able to assess the compliance status of companies on an individual and industry basis. Polluters with a poor track record would then be easily identifiable, and deficiencies in legal standards could be highlighted for future action.

4.5 Conclusion

It is anticipated that before these compliance with environmental standards reports become commonplace, tougher and more specific legislation, and the enforcement thereof, will have to be introduced. However, the need for strict and comprehensive legal standards will be reduced where widespread voluntary disclosure occurs. Since the current level of disclosures falls far short of legislated standards, voluntary disclosures are unlikely to become commonplace.

Although companies may argue that disclosures are not being voluntarily made since legal standards are often overlapping and contradictory, at least some of these standards should be complied with in the normal course of their business. Therefore there is scope for disclosures to be made by every company. Resistance to supplying this information to users of annual financial statements is to be expected since if these disclosures were made, they would probably highlight the inadequacy of compliance with legal environmental standards. The proposed phasing-in of statutory environmental audits over a four year period will probably encourage companies to provide, and users to expect, such reports in future.

The benefits of compliance with standards reports in relation to other models include the ease of comparison of disclosed performance against a benchmark, namely legal standards. Areas for the attention of management, law enforcement organisations and international business partners would be highlighted. The latter are becoming increasingly important due to the lifting of trade sanctions against South Africa. Businesses may well find that in order to conduct business with companies in other countries, compliance with that country's environmental standards may be expected.

Furthermore, an assessment of the extent of accountability assumed by a particular company can be made.

In conclusion, the nature of the problem is such that environmental issues can not be tackled from an accounting disclosure perspective alone, since the related legal and economic issues will have to be simultaneously addressed. Any developments in this area will necessarily be of an inter-disciplinary nature. However, the provision of compliance with legal environmental standards reports could be one of the first steps towards dealing with the problem.

CHAPTER 5: MEASURING THE QUALITY OF ENVIRONMENTAL DISCLOSURES

5.1 Introduction 79

5.2 Measurement of corporate social disclosures 79

5.3 Levels of measurement 81

5.4 Comparative analyses 81

5.5 Indexing approaches 82

5.5.1 Singhvi and Desai (1971) 82

5.5.2 Buzby (1974) 83

5.5.3 Barrett (1976) 84

5.5.4 Wiseman (1982) 84

5.5.5 Freedman and Jaggi (1988a) 85

5.5.6 Firth (1978, 1984) 86

5.5.7 Extensions of Firth (1978, 1984) 86

5.5.8 Cooke (1989, 1991) 87

5.6 Reliability of index scores 87

5.7 Validity of index scores 88

5.8 Construction of an environmental disclosure index 89

5.9 Weighting an index 89

5.10 Problems associated with indices 90

5.11 Uses of disclosure indices 90

5.12 Conclusion 93

5.1 Introduction

Investors, together with other users of company annual financial statements, need to be able to evaluate the quality of environmental disclosures contained therein. In some instances, disclosures could be classed as "propaganda" or "greenwashing". For example, the 1990 annual report of Omnia Limited included a special feature on the cycad as an endangered plant. This does not amount to an expression of corporate concern for the environment, merely a concern for cycads themselves.

However, many companies do in fact provide meaningful information, which can vary from very general descriptive through to company specific quantitative information. Because the degree of specificity of these disclosures varies markedly, investors are often at a loss when attempting to determine an overall objective evaluation.

Ideally, one would be able to determine a single measure of the quality of a firm's environmental disclosures, in much the same way as profit or earnings per share is treated as a measure of performance. This measure could be used for inter company comparisons, both within an industry and relative to outside or independent benchmarks. For example, in the United States of America, the Securities and Exchange Commission has promulgated rules requiring the disclosure of certain pollution information by listed companies. At present, partly due to the lack of similar independent benchmarks in South Africa, the evaluation of pollution disclosures by users of annual reports is subjective at best.

5.2 Measurement of corporate social disclosures

There are two generally accepted ways of measuring corporate social reporting (CSR), either by means of a reputation index, or by means of content analysis (Cooke and Wallace, 1989). The former occurs where knowledgeable observers rate firms according to various factors of social performance. The advantages of this approach are that internal consistency is obtained, since the

same criteria are applied to each firm by the same observer. However, this is not made out to be an objective measure of performance, since the subject matter being evaluated is inherently subjective. Furthermore, it enables the evaluators' perceptions of various firms to be summarised. Disadvantages are that the rankings obtained are subjective, and may differ between observers. The sample sizes used are generally smaller, mainly due to the fact that each item has to be individually rated by the knowledgeable observers. The subsequent extrapolation of the results to the large populations from which the sample was selected may be limited - the selected sample may not be representative of the population. Furthermore, the choice of factors to be rated is inherently subjective. Reputation indices were used by the Council of Economic Priorities (CEP) in the 1960s and 1970s, Bragdon and Marlin (1972), Cochran and Wood (1984), Folger and Nutt (1975), Spicer (1978), Moskowitz (1972, 1975), Sturdivant and Ginter (1977), Vance (1975), Heinze (1976) and Alexander and Bucholz (1978).

Content analysis is the second method of measuring CSR. The extent of reporting is usually measured by this approach, especially reporting in annual reports. Content analysis can take the form of identifying whether an item is disclosed or not, or of the type of discussion of an item (such as numeric or descriptive). Advantages of this approach are that once the items themselves have been chosen, in itself a subjective procedure, the measure is fairly objective. Larger sample sizes are also possible, since the approach is repetitive. Some of the main disadvantages associated with this approach are that the choice of items to be measured is inherently subjective (as is the case for reputational indices). Also, the analysis is based upon information explicitly disclosed by firms - they may be doing more, or even less, than they mention in the annual report. These indices therefore provide a measure of reported social behaviour, not actual social behaviour. Content analysis was used by, among others, Bowman and Haire (1975), Abbott and Monsen (1979), Anderson and Frankle (1980), Cooke (1991), Freedman and Jaggi (1988a), Ingram (1978), Preston (1978) and Wiseman (1982).

Neither content analysis nor reputational indices seem to provide an adequate means of measurement of CSR. However, there does not seem to be a more suitable method available at present, and these indices have been used in a number of studies dating from the 1960s to the present. The method therefore appears to be acceptable in practice.

5.3 Levels of measurement

There are four scales of measurement, namely, the nominal or classificatory scale, the ordinal or ranking scale, the interval scale, and the ratio scale. The nominal and ordinal scales are usually used in the social sciences (Siegel, 1956, pp 21-29 provides definitions of these scales). Disclosure indices usually provide a level of ordinal measurement, but interval measurement cannot be obtained unless all items in the index are equally important. For this reason, weighted indices are often used, in an attempt to achieve the interval scale of measurement by adjusting for differences in perceived importance of index items. However, weightings are usually extremely subjective, being obtained by means of attitude surveys of various user groups. Therefore, items of disclosure are rated, but the interval scale of measurement is not quite achieved. For example, a rating of 0 for an unnecessary item to 3 for an essential one, does not imply that an item with a rating of 3 is three times as important as an item with a rating of 1.

Furthermore, it has been suggested (Marston and Shrives, 1991) that the applicability of statistical tests to either of these measurement scales should be explictly considered prior to such tests being carried out.

5.4 Comparative analyses

The Ernst and Ernst survey of social responsibility disclosure (Ernst and Ernst, 1978), although not adopting a specific index approach, does provide a variety of means of evaluating social disclosures. The main areas investigated are the extensiveness of social responsibility disclosure, quantification, location (in annual reports and other documents) and number of pages devoted to social

responsibility disclosure. Examples of the tabular results are given in Appendix E. As with previous studies, the categories for evaluation of quantified disclosures are very general. The approach can, however, be applied specifically to pollution disclosures, with suitable modification of the categories. The other tabulations could be produced for all annual reports and/or separate industries in order to obtain an overall assessment of the pervasiveness of pollution disclosures. This does not, however, give an indication of the quality of such disclosures, but does provide useful information regarding their nature and extent. Therefore, in order to enable the comprehensive evaluation of disclosures, comparative analyses should be considered in addition to an indexing approach.

5.5 Indexing approaches

The first phase of developing an index involves the selection of items to be included in the index. The purpose of the index, as well as the target user groups, will influence the choice of items. Various user groups have been considered in indices discussed above - most authors consider financial analysts to be the sole or main user group, but Wiseman (1982) considers society in general, and Cooke (1991) does not aim his general index at any specific user group.

Literature reviews and recommended disclosures usually form the starting point for determining index items. Surveys or interviews of representatives of the selected user group can also aid in the determination of index items. Frequently, adaptation of another index to a different environment or for a different purpose, is an efficient approach. The use of an existing index, although not often encountered in practice, enables comparisons with other studies to be made.

Apart from Wiseman (1982), the following indexing approaches are all applicable to general disclosures, with limited social items included at times.

5.5.1 Singhvi and Desai (1971)

Singhvi and Desai (1971) used a weighted index, based on those developed by Cerf (1961), to evaluate the disclosures made by a company. The 34 categories of information together with their relative weights are given in Appendix F. The weightings assigned to each item, on an integer scale of 1 to 4, were determined by means of interviews of financial analysts and a survey of available literature.

However, because of the general nature of the index items, the only category which could be applicable to the environment is "Contingent liabilities", with a weighting of 2 out of a total of 68, that is, a relative importance of 2,94%. Even then, environmental aspects could be completely ignored, since the disclosure of environmental contingencies is neither mandatory nor generally accepted accounting practice in South Africa at present. Due to the small importance placed on the environment in the composition of this index, this categorisation is not appropriate for this study.

5.5.2 Buzby (1974)

Buzby used a reputational index to evaluate the extent of disclosures being made by companies. He selected the index items by means of performing a literature review, insisting that items be applicable to all firms across industries (or easily eliminated as irrelevant to a particular firm), and allowing for some degree of inter-firm variability.

Weightings of 0 to 4, from absolutely irrelevant to absolutely essential, were determined by surveying investment analysts. His instructions to respondents specified that as the provision of each extra item involves additional cost, and there is most probably a restriction on costs of information preparation, the items warranting a score of 4 should be selected first. Lower scores should then be assigned, in decreasing order of importance. If it is felt at any stage that the total cost of providing items of information will exceed budget if one more item is given, then all further items should be assigned a score of 0. This

method is, however, extremely subjective, although it does give some indication of the type of information users would prefer to be disclosed.

The weightings obtained for the index differ from those used in Singhvi and Desai (1971), in that they are not integers, but are decimals obtained by averaging the analysts' assigned scores. For the sake of completeness, the categories and their assigned mean weights are given in Appendix G.

5.5.3 Barrett (1976)

The indexing method was also used by Barrett (1976) in a comparison of annual reports of companies in various countries. The categories, although not relevant to this study due to their general nature, and assigned weightings (on a scale of 0 to 4, in units of "1/2") are listed in Appendix H.

5.5.4 Wiseman (1982)

Wiseman (1982) developed an index approach, based on the previously discussed ones, which dealt specifically with pollution disclosures. The index scores were determined for each industry, and for each index item the number of firms with each possible score were also shown. The items were grouped into four main categories, namely economic factors, litigation, pollution abatement and other environmentally related information. The details of these categories are given in Appendix I. A line count index was also determined per industry, based on the Ernst and Ernst survey approach.

This method is notable in that it provides a relatively objective measure of the quality of environmental information contained in annual reports, as well as enabling inter company comparisons to be made within an industry.

The rating is determined, not in terms of degree of perceived inportance, as in Buzby (1974), but in terms of the degree of specificity of the disclosures. Wiseman used the following ratings for each item:

0 if no disclosure is made
1 if disclosed in general terms only
2 if non-quantitative but company-specific (as opposed to purely general) information
and 3 if monetary or quantitative disclosure was made.

More emphasis was placed on the last category as it was perceived that monetary or quantitative measures are the most preferred form (Council on Economic Priorities, 1975).

Six indices were then computed, one a general industry score, one for each of the four index categories, and a line count index. These were then compared to the Council on Economic Priorities (CEP) requirements (reproduced in Appendix J) in order to objectively evaluate the results. Unfortunately, in South Africa there is no similar independent body which compiles pollution and/or general environmental measures against which any results could be evaluated. This is an unavoidable shortcoming associated with either replicating Wiseman's study or conducting a similar study in South Africa at this stage. This does not imply, however, that repeating the analysis would be entirely futile - just that less emphasis could be placed on the results due to the lack of an independent objective benchmark.

5.5.5 Freedman and Jaggi (1988a)

A weighted index incorporating the amount of emissions and capital expenditure of a company was developed by Freedman and Jaggi. The weights were assigned in relation to their "perceived importance" in units of 1/2, and ranged from 0 to 2,5. Perceived importance was evaluated according to Environmental Protection Agency standards, and whether information affecting the future was disclosed. Future expenditures were seen to be more important than present or past ones, since they are likely to have greater impact on any investment decision. Perhaps the most important category is that of emissions standards together with the firm's actual emissions, which provides a means of measuring the firm's overall pollution performance. This is more objective than

the disclosure of past or potential costs, since cost alone provides no indication of the extent to which pollution is being contained or minimised. Descriptive information, of a more general nature, is assigned the least weight due to its inherent subjectivity.

Interestingly, Freedman and Jaggi found that the extensiveness of disclosures was positively influenced by a company's negative financial performance.

5.5.6 Firth (1978, 1984)

Firth (1978) developed an index consisting of 75 items, which were weighted on a scale of 1 to 5 by surveying various user groups. The only line items applicable to environmental reporting were contingent liabilities and CSR information (specifically company attitude and expenditures). These index items are thus not entirely relevant to the measurement of CSR, and in particular to the subset of environmental reporting.

In his 1984 paper, Firth used the same approach, but pruned the list of index items down to 48. Items that were required to be disclosed in terms of statute, and those that were not expected to be present in companies were excluded. The resulting index is thus not of a general nature, as it focuses on specific items of disclosure relevant to specific user groups.

5.5.7 Extensions of Firth (1978, 1984)

Firth's approach was adapted to the South African situation by Firer and Meth (1986). An index of 49 items was selected, and these were weighted on a 1 to 5 scale as before. The weightings of the index items determined by analysts, directors and the firms were compared to Firth's rankings (determined by his study in the United Kingdom).

Another extension in the Mexican environment was Chow and Wong-Boren (1987). The 24 index items were ranked, however, using a scale of 1 to 7.

Wallace (1988) developed a list of 109 index items, which were rated on a scale of 1 to 5. Items required to be disclosed in terms of statute were not excluded as he believed that the index should cater to more than one user group. This method is another that is not applicable to the environment as it stands, since the only index category which could possibly relate to the environment is that of contingent liabilities.

5.5.8 Cooke (1989, 1991)

Since different classes of users will assign different weightings to specific index items, for an index to be generally applicable, it should be unweighted (Cooke, 1989). The first index (Cooke, 1989) consisted of 224 items, and the second (Cooke, 1991) of 106. Items were assigned a score of 0 if there was no disclosure, and 1 if disclosed. However, the inapplicability of any particular item to a company did not result in a zero score. Rather, the number N of the applicable items was calculated, and the sum of the assigned scores V was divided by N to obtain an index of voluntary disclosure for that company. This method enables meaningful inter-firm comparisons to be made, and eliminates penalties associated with the inapplicability of index items to a firm.

The first index, with 224 items, had 32 items relating to social responsibility accounting, a perceived CSR importance of 14%. The percentage for the second index was, however, 10%. These indices, apart from Wiseman (1982), have the highest degree of "coverage" of CSR disclosures.

5.6 Reliability of index scores

For the results of any research to be reliable, another researcher should be able to replicate them. As far as rating disclosures contained in annual financial statements is concerned, there is no obstacle due to the passage of time. This is because these statements are published annually, and their contents cannot subsequently change.

Where, however, the applicability of an index item to a company is not certain, there should be documented procedures which should be followed in order to clarify the issue. This criterion was met by Buzby (1974) and Cooke (1989).

Another means of ensuring the validity of index scores is to use two or more evaluators, who then jointly reconcile any rating differences. The only indexing method discussed above that involved the use of more than one evaluator of the disclosures was Wiseman (1982). Other approaches are therefore somewhat more subjective in their approach in this respect.

5.7 Validity of index scores

The validity of index scores is a function of their meaning, that is, they can be considered valid only if they have meaning as a measure of information disclosure. The validity of index scores has been considered implicitly by most researchers. However, Cooke and Wallace (1989) have recommended that researchers should explicitly consider the validity and reliability, or otherwise, of their index measures.

Indices in various forms are common, for example price indices, and this has probably supported the acceptance of disclosure indices without rigorous proof or testing. This does not imply that disclosure indices per se are valid measures of disclosure. They seem to have been accepted since there appear to be no available alternatives.

Furthermore, the adaptation of various index techniques by researchers to specific problems or environments has indicated the lack of a single valid measure of disclosure. The development of a single multi-purpose index has not been explicitly considered (Marston and Shrives, 1991), and there is scope for further research in this area.

5.8 Construction of an environmental disclosure index

Factors which should be taken into account when selecting index items for the evaluation of environmental disclosures are the type and nature of pollution, and possible measures both in terms of input (or committment by the company) and output (or actual pollution performance of the company). Examples of detailed characteristics along these lines can be found in Dierkes and Preston (1977), and are reproduced in Appendix K. Examples of social performance reports of foreign firms given in the same paper are also reproduced in Appendix L.

A list of criteria concerning the impact of a firm upon its surrounding physical environment, included in a more general social list in Jensen (1976, p197), is given in Appendix M.

5.9 Weighting an index

Index items are weighted where they are perceived to have varying degrees of importance. These weightings can be obtained by means of a review of the related literature and/or a survey of the appropriate user group. The surveyed weightings could either be averaged (as in Buzby, 1974) or kept as integers (Cerf, 1961).

Where the user group is not clear, or where no specific user group is prefered above others, equal weighting could be used. Cooke (1989, 1991) adopted this approach, assuming that different users would apply different weightings, and hence for an index to have general applicability no distinction as regards the importance of individual index items should be made. His effective assumption (Marston and Shrives, 1991) was that the weightings applied by different user groups would average themselves out. This assumption is not necessarily correct, however.

That weighted and unweighted indices yield different results is clear from the following example. Consider an index of 10 items, with the disclosure of the

first five being each assigned a score of 1, and the other five a score of 2. The index score would be 5 if only the first 5 items are disclosed, and 10 if only the second 5 are disclosed. But the respective scores for unweighted indices for the same disclosures would be equal, at 5 each. Where there is, however, a large number of index items, there may not be significantly different results between weighted and unweighted indices. But there is still a possibility that the results could differ.

It therefore appears that both the weighted and the unweighted index scores should be considered in any study utilising the indexing technique, since they would yield different results.

5.10 Problems associated with indices

As mentioned previously, the assignment of a higher weighting to an index item does not necessarily mean that that item is worth, say, three times as much as another. This assignment of weights is therefore inherently subjective.

A further problem generally encountered, is whether an index item is in fact applicable to a specific company. Non-disclosure implies either that disclosure has been rejected, or that the item is irrelevant to the company. Whether or not disclosure has been rejected by the company is difficult to determine, but Cooke (1991) suggested that a decision should be made after reading the entire annual report. This is still subjective, and there is scope for the development of a more objective decision-making process.

5.11 Uses of disclosure indices

The size, and number of shareholders, of the reporting company have each been found to influence the extent of disclosures (Singhvi and Desai, 1971). The effects of company size on disclosure was supported by Buzby (1975), Chow and Wong-Boren (1987) and Cooke (1989), while Cerf (1961) found a link between asset size and the extent of disclosure.

Furthermore, disclosures made by listed as opposed to unlisted firms was found, on average, to be of a better quality (Cerf, 1961; Singhvi and Desai, 1971; Cooke, 1989). Smaller, and unlisted firms, may feel that the voluntary disclosure of items may provide their competitors with an advantage. Larger firms, however, could gain more from the public relations effects of disclosure, and the costs of generating the information would probably be smaller than those of a small firm. Buzby (1975), however, found that whether or not a company was listed had no effect on the amount of disclosure.

The type of CPA firm involved in the audit of companies was also found to have an effect on the quality of the disclosures, with quality improving with increased CPA firm size. The rate of return and earnings margin were also found to have a positive relationship with the extent of disclosures.

Buzby (1974) found that, in general, the disclosures being made were minimal, while Barrett (1976) discovered a link between the quality of disclosures and the degree of efficiency of national equity markets (his study concerned companies in 7 countries).

Various studies have assessed the impact of social disclosure and economic performance. Freedman and Jaggi (1988) found that large firms with poor economic performance are likely to provide pollution disclosures, as if to excuse it. For small firms, no relationship was identified. Cochran and Wood (1984) discovered a relationship between the average age of corporate assets and CSR disclosures. After this relationship had been controlled for, a relationship between CSR and financial performance was still identified.

Abbott and Monsen (1979) developed a corporate social involvement disclosure scale based on content analysis similar to Ernst and Ernst (1978), and used this to assess whether social disclosures were associated with profitability. They found that investor's total return did not appear to increase with social involvement, nor was social involvement dysfunctional for the

investor. Other studies which assessed the relationship between financial performance and CSR disclosures are Singhvi and Desai (1971), Cooke (1989), Chow and Wong-Boren (1987).

Abbott and Monsen (1979) assessed the relationship between voluntary disclosure and security risk measures by using an index developed by Firth (1984). They found that part of the growth in size of annual reports was due to increasing levels of voluntary disclosure. However, their empirical tests found no evidence of the disclosure score having any impact on the company's beta, nor on the error function in the model explaining beta. Therefore, these greater levels of disclosure are not caused by the assessment of systematic risk.

Agency theory has been used in the area of social disclosure. Ness and Mirza (1991) demonstrated that agency theory can be used for developing and testing hypotheses when explaining corporate social disclosure. Their study focused particularly on the relationship between the oil industry and environmental disclosures, and social disclosure was found to improve management's welfare, a result which is consistent with agency theory. Disclosures tended to reflect favourable social performance, as opposed to adverse environmental effects.

The increase in social disclosures by oil companies after the Exxon Valdez oil spill was significant, and related to company size as well as ownership in the Ayeleska Pipeline Service Company (which was supposed to attend to oil spills in its area within 5 hours, but didn't) (Patten, 1992). This result supports legitimacy theory, namely that the environmental disaster legitimated the related disclosures. Chow and Wong-Boren (1987) used agency theory to suggest variables for explaining variations in corporate disclosure, especially cross-sectional variations. Their article was, however, the only one to combine an indexing approach with agency theoretic arguments.

The relationship between social disclosure and actual social performance was assessed by Ingram and Frazier (1980). They established a weak association

between quantitative measures of disclosure content and independent measures of social performance. However, they noted that this could be due to the lack of independent monitoring of such disclosures. If stricter monitoring were in place, a stronger relationship may well be detectable. However, the lack of monitoring does not necessarily imply that there will be no such association. Furthermore, selections could be biased in order to achieve better results. They highlighted the need for the development of a more objective measure.

Wiseman (1982) demonstrated that there was no association between the (index) measured contents of a firm's environmental disclosures and the firm's actual environmental performance, as measured by Council on Economic Priorities rankings. Furthermore, environmental disclosures in annual reports were shown to be incomplete.

5.12 Conclusion

Disclosure indices have been used as a research tool for a number of years. There are, however, several difficulties associated with their use. Firstly, the construction of an index is an inherently subjective procedure. Other subjective areas are the determination of weightings, and the assignment of scores to companies. It does not seem that subjectivity on the part of the researcher can be entirely removed. In fact, such an expectation is unreasonable (Marston and Shrives, 1991). Although indices do provide some degree of objective evaluation of disclosures, a researcher should attempt to minimise subjectivity as far as possible, and any results obtained using this research approach should be assessed accordingly.

CHAPTER 6: RESEARCH METHODOLOGY

6.1 Objectives and hypotheses 95

6.2 Research methodology 96

6.3 Wiseman's index categories 99

6.4 List of index items 100

6.5 Index weightings 102

6.1 Objectives and hypotheses

The objectives of this study (as set out in section 1.2.1) are as follows:

1. To review the accounting, economic and legal literatures and determine an appropriate environmental reporting model.

2. To use and extend an existing indexing/weighting method (Wiseman, 1982) to evaluate the quality of environmental disclosures contained in the annual financial statements of South African companies operating in selected potentially polluting industries.

2a. To determine whether the quality of environmental disclosures in the oil, paper and steel industries was lower than in their American counterparts.

2b. To determine whether or not there has been an improvement in the quality of such disclosures over the period represented by 1986/87 and 1990/91 annual financial statements.

2c. To assess whether or not the quality of environmental disclosures is influenced by company size and/or the existence of significant foreign shareholders.

The related hypotheses (refer section 1.3.1) are:

1. The most appropriate environmental reporting model, from both legal and economic perspectives, is that of compliance with legal environmental standards.

2a. The quality of environmental disclosures in the oil, paper and steel industries (the industries considered in Wiseman (1982)) is low in comparison with their American counterparts.

2b. The quality of environmental disclosures has improved over the period examined (1990/91 annual financial statements compared directly to 1986/87 annual financial statements).

2c. The quality of environmental disclosures is positively influenced by the reporting entity's size (measured by total assets) and the presence of significant foreign shareholders.

Asset size is considered since the size of a company was found to influence the extent of disclosure (Cerf (1961), Buzby (1975), Chow and Wong-Boren (1987) and Cooke (1989)). Foreign shareholders were included since the disclosure policies of local companies can reasonably be expected to be influenced by their foreign shareholders.

The first objective was met by means of the reviews of the economic, legal and accounting literatures dealt with in chapters 2 to 4. The reviews aided in the development of a suggested environmental reporting model for South Africa, which was outlined at the end of chapter 4.

The other objectives were met by means of tests of the related hypotheses. The detailed tests are summarised below.

6.2 Research methodology

The status quo of South African environmental reporting was evaluated in the manner set out below:

A list of index items by means of which the quality of environmental disclosures could be assessed was developed, based on a survey of the literature. This consisted primarily of a modification of Wiseman's (1982) index.

The relative weighting of the index items, as well as the assignment of scores where these items are disclosed, were determined and justified. Various weightings and allocations of scores, which were used as a basis for the determined index, were discussed in Chapter 5. Since the use of weighted and unweighted indices can yield different results, both were used.

In order to compute the indices, a survey of the most recent (i.e. 1990 or 1991 year end, whichever is later and published before mid December 1991) annual financial statements of companies listed on the Johannesburg Stock Exchange was performed. Companies selected were those in each of the following potentially polluting sectors, included in potentially polluting activities mentioned in section 21 of the Environment Conservation Act 73 of 1989:

a) steel and allied
b) coal
c) paper and packaging
d) oil and chemicals
e) transport
f) metals and minerals
g) gold
h) electricity

Where, however, a company in one of these sectors did not exist for both the 1986/87 and 1990/91 years, it was excluded from the sample.

The following information was collected for each company surveyed:

1. Whether environmental disclosures are monetary, non-monetary, or both; and the rating or score for each index item disclosed according to the degree of specificity of the information provided; and

2. The size of the company (in terms of total assets) and the presence of foreign shareholders, if any.

This enabled the effects of industry, company size and/or foreign shareholders on the index scores to be assessed.

Where a set of company 1990/91 annual financial statements obtained a non-zero rating, the rating for that company's 1986/87 annual financial statements was computed. This enabled the determination of whether any improvement in the quality of environmental disclosures, as measured by the indices, occurred.

The same process was followed for Eskom, an unlisted company in the power generation industry (a sector that does not include any listed companies but is included in the list of potentially polluting industries in the Environment Conservation Act).

Where an index category was not disclosed by any of the companies surveyed, it was eliminated from the list of index categories. Non-disclosure does not necessarily mean that the index category is not desirable. Rather, a summary of existing disclosures will be compiled, against which all companies will be evaluated. Refer to section 7.2 for details of the index categories that were not disclosed by any company in the sample.

The following numbers were then computed:

a) the percentage of disclosing companies, per sector
b) index scores per company (overall and subcategories)
c) average index score per sector (overall and subcategories)
d) R^2, the coefficient of correlation, where asset size is the independent variable, and the disclosure index the dependent variable in regression analysis.

e) R^2, where foreign shareholders is the independent variable, and the disclosure index score again the dependent variable in regression analysis.

This enabled an assessment of the relationships, if any, between asset size and foreign shareholders and the quality of environmental disclosures as represented by index scores.

The data collected was then used to compute a Wiseman (1982) index so as to enable comparison of South African and American environmental disclosures for the oil, paper and steel industries (the industries used in Wiseman's study).

The results of these comparisons and the interpretation of assigned scores were then summarised, and examples of disclosures by industry were recorded.

The index forming the basis of the one to be developed is Wiseman (1982). For ease of reference, the index categories are reproduced below.

6.3 Wiseman's index categories

Wiseman's categories are as follows:

1. *Economic factors*

   Past and current expenditures for pollution control equipment and facilities.
   Past and current operating costs for pollution control equipment and facilities.
   Future estimates of expenditures for pollution control equipment and facilities.
   Future estimates of operating costs for pollution control equipment and facilities.
   Financing for pollution control equipment or facilities.

2. *Litigation*
   Present litigation.
   Past litigation.

3. *Pollution abatement*
   Air emission information.
   Water discharge information.
   Solid waste disposal information.
   Control, installations, facilities or processes described.
   Compliance status of facilities.

4. *Other environmentally related information*
   Discussion of regulations and requirements.
   Environmental policies or company concern for the environment.
   Conservation of natural resources.
   Awards for environmental protection.
   Recycling.
   Departments or offices for pollution control.

6.4 List of index items

The first step towards achieving the remaining objectives was that of compiling a list of index items.

The following list of index items was compiled from a review of the literature, especially Cerf (1964), Singhvi and Desai (1971), Buzby (1974), CEP (1974), Jensen (1976), Dierkes and Preston (1977), Wiseman (1982), Barrett (1986) and Freedman and Jaggi (1988). Index categories used in some of these papers, together with related weightings, can be found in Appendices F to K. The following list is split according to Wiseman's categorisation, namely, economic factors, contingencies and litigation, pollution abatement, and other environmentally related information. The index obtained using this list of index items is referred to in this dissertation as the modified Wiseman index.

THE MODIFIED WISEMAN INDEX

ECONOMIC FACTORS

Pollution control equipment and facilities (including recycling equipment)
Past and current capital expenditures
Future estimated capital expenditures
Past and current operating costs
Future estimated operating costs

Financing
Research and development expenditures

SUB TOTAL

CONTINGENCIES AND LITIGATION

Present litigation
Potential litigation
Fines, settlements and criminal penalties paid during the year and for which currently liable
Present cleanup costs (in event of disaster or otherwise)
Potential cleanup costs

SUB TOTAL

POLLUTION ABATEMENT

AIR EMISSIONS
- Policy and goals, activity and measure described
- Per pollutant and per point source, actual and allowable emissions

WATER DISCHARGES
- Per pollutant: net and gross effluent
  water flow per day
  temperature differential
  receiving environments described
- Effects on aquatic life
- Water charges

SOLID/SEMI-SOLID WASTE DISPOSAL
- Type and content of waste
- Rate of disposal per type
- Disposal technique (dumped or sold) per type

NOISE
- Noise level (at nearest residence)
- Comparison with legislated standards

DESPOLIATION OF LANDSCAPE
- Rehabilitation of landscape
- Beautification
- Land reclamation and reforestation
- Efforts to contain oil or chemical spills, or potential spills
- EXCLUDES:
- Environmental protection and repair companies
- Reforestation by timber companies, except where beyond normal business requirements

RAW MATERIALS
- Renewable, non-renewable distinction, different usage
- Type used
- Waste produced
- Research and development: substitution, recycling
- Glass, metals, oil, water, paper, plastic recycled
- Use of recycled materials
- EXCLUDES: conservation of energy resources
  adaptation to different fuel type

PACKAGING
- returnable waste

TRANSPORT
- modal policy

energy use
pollution generated (per category above)
ENERGY
Savings measures
Consumption
- total
- oil, gas, coal, timber, other
Re-use of waste heat
CONTROLS, INSTALLATIONS, FACILITIES, PROCESSES
Type and efficiency (in terms of pollution abatement)
New installations planned or under construction
statement that pollution has been / will be reduced
EXCLUDES:
discussion in case of manufacturer of pollution control equipment
COMPLIANCE STATUS
Schedules showing compliance with legal
requirements, per category above
Complaints schedule

SUB TOTAL

OTHER ENVIRONMENTALLY RELATED INFORMATION
Discussion of regulations and requirements
Environmental policies or company concern for environment
Conservation of natural resources
Awards for environmental protection
Seminars/research grants given, conferences hosted etc.
Recycling and resulting by-products
Departments or officers for environmental control (including environmental audit)
Factors which could influence future results
Disclosure of accounting policy
environmental liability in balance sheet
provision in balance sheet
movement on provision account
amounts in cash flow statement
amounts in income statement
contingent liability
Environmental impact studies
Designing facilities harmonious with environment
Using clean fuels
Support for campaigns e.g. "Keep SA Clean", or SA Nature Foundation

SUB TOTAL

6.5 Index weightings

The first weighting that was calculated was initially used by Wiseman (1982). The index items were rated according to the degree of specificity and their presence or absence as follows:

0 if the item was not disclosed;
1 if the item was mentioned in general terms;
2 if company-specific but non-quantitative disclosure of the item was made; and
3 if the disclosure was the item was disclosed in quantitative terms, monetary or otherwise.

The results obtained using this weighting on Wiseman's index categories were compared to Wiseman's results, both for the overall index and the indices for each sub-category (economic factors, litigation, pollution abatement, and other environmentally related information). This gave an indication of the differences between South African and American environmental reporting in the oil, paper and steel industries.

The second weighting that was used was based on that developed by Cooke (1989 and 1991). Cooke's index required the number **N** of index items applicable to the company under consideration to be calculated. Then each of those index items should be rated according to the scale 0 for non-disclosure, and 1 for disclosure of the item. The sum of these ratings, **V**, is then divided by **N**, the number of applicable index items, to determine the Cooke index score **V/N** for that company. Since none of the weighted indices involve the division of the assigned scores by the number of applicable index items, they cannot meaningfully be compared to a Cooke index. Therefore the sum of the ratings **V** was not divided by **N**, and **V** was used for the purposes of comparing the results of the unweighted "Cooke" index with other weighted indices.

These two weightings were used for the modified Wiseman index developed in this study (refer section 6.4), with the non-Wiseman index items not disclosed by any company excluded (see section 7.2), and the resulting scores were compared and analysed.

The results of the survey of annual financial statements and the indexing approach are set out in the following chapter.

CHAPTER 7: RESULTS

7.1 Introduction 105

7.2 Non-Wiseman index items not disclosed by any company in the sample..... 106

7.3 Index scores 107
- 7.3.1 Relative industry rankings 109
- 7.3.2 Disclosure quality and legislation 110

7.4 Factors influencing index scores 110
- 7.4.1 Index scores and total assets 111
- 7.4.2 Index scores and foreign shareholders 113
- 7.4.3 Regression analysis of non-zero index scores and total assets 116
- 7.4.4 Index scores and the presence of foreign shareholders 118
- 7.4.5 Large groups and index scores 119

7.5 Examples of disclosures per index item 120
- 7.5.1 Number of disclosing companies 120
- 7.5.2 Index scores per subcategory 120
- 7.5.3 Economic factors 121
- 7.5.4 Pollution abatement 121
- 7.5.5 Other environmentally related information 121
- 7.5.6 Financial disclosures 122

7.6 Industry-specific disclosure trends 122
- 7.6.1 Coal 123
- 7.6.2 Diamonds 126
- 7.6.3 Gold 127
  - 7.6.3.1 Gold - Wits and others 127
  - 7.6.3.2 Gold - Evander 128
  - 7.6.3.3 Gold - Klerksdorp 128
  - 7.6.3.4 Gold - OFS 128
  - 7.6.3.5 Gold - West Wits 128
  - 7.6.3.6 Gold - Curtailed operations 129
- 7.6.4 Copper 129
- 7.6.5 Manganese 130
- 7.6.6 Platinum 130
- 7.6.7 Tin 130
- 7.6.8 Other metals and minerals 131
- 7.6.9 Mining holdings 131
- 7.6.10 Mining houses 132
- 7.6.11 Industrial - chemicals and oil 132
- 7.6.12 Paper and packaging 133
- 7.6.13 Steel and allied 135
- 7.6.14 Transportation 135
- 7.6.15 Electricity 135

7.7 Conclusion 136

7.1 Introduction

The source of listed companies for the sample was the Johannesburg Stock Exchange Handbook. Each of the companies in the sectors to be surveyed was assessed for suitability - if the company was listed less than five years before the 1990/91 year end, then it was excluded from the sample. Companies were also excluded if they were cash shells, as these would skew the results of any statistical analysis.

Each of the remaining companies' 1990/91 annual financial statements were evaluated against the list of desirable disclosures developed at section 6.4. Items for which no examples of environmental disclosures were identified were then excluded from the list for the purposes of developing a shortened "modified Wiseman" index.

Where a company had a positive index score for the 1990/91 annual financial statements, the 1986/87 annual financial statements were also evaluated against the "modified Wiseman" list of index items.

Environmental disclosure information gathered during the survey of annual financial statements was used to compute three indices, using the different weightings and/or different index items as discussed in Chapter 6.

The first index computed was that developed by Wiseman (1982). Wiseman's weightings were also used on the "modified Wiseman" index items developed as described above. The third index was Cooke's unweighted index, also using the "modified Wiseman" index items but for the purposes of comparison the company scores were not divided by the number of applicable index items.

These indices were computed for each company, for 1990/91, and 1986/87 where applicable. The average score per industry was also computed. Then the relative ranking of the average industry scores was determined for the purposes of inter-industry comparison.

The results of this survey and indexing approach are summarised in the following section.

7.2 Non-Wiseman index items not disclosed by any company in the sample

The following items in the modified Wiseman index developed in section 6.4 (other than those in the Wiseman index), were not disclosed by any company in the sample:

POLLUTION ABATEMENT
AIR EMISSIONS
Per pollutant and per point source, actual and allowable emissions
WATER DISCHARGES
Per pollutant: water flow per day
temperature differential
receiving environments described
SOLID/SEMI-SOLID WASTE DISPOSAL
Rate of disposal per type
Disposal technique (dumped or sold) per type
NOISE
Noise level (at nearest residence)
Comparison with legislated standards
DESPOLIATION OF LANDSCAPE
Efforts to contain oil or chemical spills, or potential spills
EXCLUDES:
Environmental protection and repair companies
Reforestation by timber companies, except where beyond normal business requirements
RAW MATERIALS
Renewable, non-renewable distinction, different usage
Type used
Waste produced
Research and development: substitution, recycling
EXCLUDES: conservation of energy resources
adaptation to different fuel type
PACKAGING
returnable waste
TRANSPORT
modal policy
energy use
pollution generated (per category above)
ENERGY
Consumption
- total
- oil, gas, coal, timber, other
Re-use of waste heat

CONTROLS, INSTALLATIONS, FACILITIES, PROCESSES
Type and efficiency (in terms of pollution abatement)
statement that pollution has been / will be reduced
EXCLUDES:
discussion in case of manufacturer of pollution control equipment
COMPLIANCE STATUS
Schedules showing compliance with legal
requirements, per category above
Complaints schedule

OTHER ENVIRONMENTALLY RELATED INFORMATION
Seminars/research grants given, conferences hosted etc.
Recycling and resulting by-products
Factors which could influence future results
Disclosure of environmental liability in balance sheet
Designing facilities harmonious with environment

7.3 Index scores

The results of the index scores per index per industry are summarised in the table on the next page.

This table facilitates an overall assessment of the relative index scores. Companies in the sample, together with their respective Wiseman, modified Wiseman and Cooke index scores (with the index items listed in section 7.2 excluded), can be found at Appendix N. The modified Wiseman index items, an extension of the items found in Wiseman's index, were developed as described in the introduction to this chapter.

The total 1990/91 disclosure score, for all industries, is highest for the modified Wiseman index at 43.53. The unweighted Cooke index provides the lowest overall score, as might be expected. However, an unweighted index does not always produce the lowest score, as can be seen by comparing the 1986/87 totals for Cooke and Wiseman indices.

The choice of index items impacts on the index scores obtained. The modified Wiseman index, an extension of the Wiseman index, results in index scores at least equal to those of the Wiseman index for all industries.

INDUSTRY and companies in sample		WISEMAN INDEX SCORES 1990 1991	Rank	1986 1987	Rank	MODIFIED WISEMAN SCORES 1990 1991	Rank	1986 1987	Rank	COOKE INDEX SCORES 1990 1991	Rank	1986 1987	Rank
Coal	7	2.86	2	0.00	6	5.14	2	0.43	1	2.71	2	0.17	3
Diamonds	6	0.83	9	0.00	6	1.17	11	0.00	8	0.50	9	0.00	8
Gold	57	0.16	12	0.00	6	1.53	8	0.21	5	0.56	8	0.07	7
Copper	4	1.50	6	0.00	6	2.00	7	0.00	8	1.25	5	0.00	8
Manganese	2	1.50	6	0.00	6	1.50	9	0.00	8	1.50	4	0.00	8
Platinum	7	0.00	13	0.00	6	0.29	14	0.00	8	0.14	12	0.00	8
Tin	2	0.00	13	0.00	6	4.50	3	0.00	8	1.50	4	0.00	8
Other metals	8	0.63	8	0.50	5	2.88	5	1.38	3	1.00	6	0.63	1
Mining houses	10	2.20	4	0.11	3	3.89	4	0.11	7	1.67	3	0.11	6
Mining holding	19	0.47	10	0.11	3	1.21	10	0.37	4	0.47	10	0.16	4
Chemicals and oil	7	2.14	3	0.14	2	2.14	6	0.14	6	1.00	6	0.14	5
Paper & packaging	21	1.71	5	0.35	1	1.95	7	0.41	2	0.90	7	0.29	2
Steel and allied	4	0.50	7	0.00	6	1.00	12	0.00	8	0.50	9	0.00	8
Transportation	9	0.33	11	0.00	6	0.33	13	0.00	8	0.22	11	0.00	8
Electricity	1	12.00	1	0.00	6	14.00	1	0.00	8	6.00	1	0.00	8
	164	26.83		1.21		43.53		3.05		19.92		1.57	
Aggregate (average)		0.164		0.008		0.265		0.019		0.121		0.010	
Scale of scores		0-54		0-54		0-78		0-78		0-26		0-26	

The difference in aggregate score between Wiseman and modified Wiseman indices is indicative of the fact that financial disclosures comprise a significant portion of overall environmental disclosures, and that these disclosures sometimes do not fall within the other more general index categories. For example, the raising of a provision for environmental restoration or rehabilitation does not necessarily constitute an explicit statement of environmental concern by the discloser.

7.3.1 Relative industry rankings

As can be expected, relative rankings of the index scores are influenced by the choice of weighting. The electricity and coal industries consistently had ranks 1 and 2 respectively across all 1990/91 indices, and platinum ranked last in each case. The manganese, tin, other metals, and manufacturing industries, on the other hand, showed significant changes in the 1990/91 ranking across index types.

Changes in relative rank can be influenced by the total number of companies in each sector, or by a significant increase in the number of disclosing companies in a sector over time.

Overall analysis reveals that the relative rankings between the weighted modified-Wiseman and unweighted Cooke indices remain fairly constant, except that of manganese. This can be attributed to the heavy weighting applied to one or two disclosures in the Wiseman index, influencing the relative ranking of those industries with more specific quantitative disclosures. The same index score was obtained by companies in the manganese sector, irrespective of the index or weighting used, due to the general nature of the disclosures.

7.3.2 Disclosure quality and legislation

The increase in quality of disclosures over the period is apparent at a glance - the aggregate scores in 1986/87 ranged from 1.21 to 9.05, and for 1990/91 between 19.92 and 43.53. Although this increase appears marked, the quality of disclosures still ranks far below that of USA disclosures in the 1970s - approximately 20 years ago. Refer to Appendix O for a comparison of South African and American disclosures for the oil, paper and steel industries that were used in Wiseman's study (Wiseman, 1982).

Wiseman's study included tests of correlation between financial statement environmental disclosures and the independent Council of Economic Priorities (CEP) reports. American law requires the provision of certain detailed information, including volumes of emissions and abatement costs, to environmental bodies. Furthermore, this information usually becomes publicly available.

An independent environmental monitoring agency such as the CEP does not exist in South Africa. Similar correlation tests therefore cannot be performed on South African data. Although producers may have to report information to the Department of the Environment, this information seldom becomes publicly available. The large discrepancies in index scores between countries could be due to significant differences in environmental legislation and the enforcement thereof, the lack of an independent environmental monitoring body in South Africa, or differences in public perceptions.

7.4 Factors influencing index scores

Statistical analysis on the relationship between total assets and index scores, and foreign shareholders and index scores (using the index score obtained for the modified Wiseman index) was performed using least squares regression analysis.

For each regression, the normal equations $\Sigma y = na + b(\Sigma x)$ and $\Sigma xy = a(\Sigma x) + b(\Sigma x^2)$ were used to determine the coefficients a and b in the regression equation $y = a + bx$. The coefficient of determination, r^2, was then calculated, and used to calculate r, the coefficient of correlation. This enables one to determine whether there is a degree of association or correlation between the variables.

The standard error of the estimate S_e, and the standard error of the coefficient b S_b, were also calculated. These were used to calculate the t-factor, which is used to calculate the critical F confidence level for the population, and accepting (or rejecting) the inputted predicting variables according to whether the critical F confidence level is greater (or less) than 95%.

7.4.1 Index scores and total assets

For the regression analysis of total assets and index scores, y represents index scores and x represents total assets.

The normal equations $\Sigma y = na + b(\Sigma x)$ and $\Sigma xy = a(\Sigma x) + b(\Sigma x^2)$ can be rearranged as follows:

$$a = \frac{(\Sigma y)(\Sigma x^2) - (\Sigma x)(\Sigma xy)}{n(\Sigma x^2) - (\Sigma x)(\Sigma x)}$$

$$b = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{n(\Sigma x^2) - (\Sigma x)(\Sigma x)}$$

The data accumulated in Appendix T gives

Σy = 315 (the sum of observed index scores)

n = 163 (the number of companies in the sample)

Σx = 226 420 874 (the sum of total assets of the 163 companies)

Σxy = 1 337 218 304

Σx^2 = 2 791 714 983 536 540

Substitution of these values in the equations for a and b above gives a = 1,4182 and b = 0,0000004.

These coefficients are used to obtain a predicted value index score y′ for each company in the sample. These predictive values are used to obtain a measure of the goodness of fit of the regression line in the following manner:

The deviation of y from the mean **y** is calculated as $\Sigma(y - \mathbf{y})^2$, where **y** is the mean of the y values (i.e., $(\Sigma y)/n$), and can be explained by x. The second possible deviation of y from the line is given by $\Sigma(y - y')^2$, which cannot be explained by x. The measure of the goodness of fit of the regression line is made by comparing these deviations:

$\Sigma(y - y')^2 / \Sigma(y - \mathbf{y})^2 = 1506 / 1834 = 82,1\%.$

Therefore 82,1% of the variation in index scores can be attributed to random variation or chance and the effect of other variables not incorporated into the model. The remaining 17,9% of the variation in index scores can be attributed to changes in total assets.

The coefficient of correlation $r = \pm\sqrt{0,179} = 0,4232$. This means that there is a positive correlation of just 42,32% between index scores and total assets. This correlation is low, and may be caused by an inaccurate regression line being used for predictions. In order to assess whether the null hypothesis B=0 representing a zero relationship between total assets and index scores is true or false, the standard error of estimate and standard error of the b coefficient need to be calculated.

The standard error of the estimate is:

$$S_e = \sqrt{\frac{\Sigma(y - y')^2}{n - 2}}$$

$= 3,049$

and the standard error of the b coefficient is:

$$S_b = \frac{S_e}{\sqrt{(x - \bar{x})^2}}$$

$$= \frac{3{,}049}{\sqrt{1834}}$$

$$= 0{,}0712$$

Assuming a null hypothesis of B=0, the coefficient b would be

$b / S_b = 0{,}0000004 / 0{,}0712 = 0{,}0000051$ standard errors from a no-relationship position. This t-value of 0,0000057 is less than 1,282, the t-value associated with a 90% confidence level at 161 degrees of freedom (based on the sample size of 163), so total assets are not a significant presictive variable for index scores.

This, together with the low correlation of 42,32%, means that index scores are not influenced by the total assets of the company.

7.4.2 Index scores and foreign shareholders

For the regression analysis between index scores and foreign shareholders, y represents the index scores and x the presence or absence of foreign shareholders.

Substituting the following data accumulated in Appendix T

Σy = 315 (the sum of observed index scores)

n = 163 (the number of companies in the sample)

Σx = 12 (the sum of foreign shareholders of 163 companies)

Σxy = 8

Σx^2 = 12

in the equations

$$a = \frac{(\Sigma y)(\Sigma x^2) - (\Sigma x)(\Sigma xy)}{n(\Sigma x^2) - (\Sigma x)(\Sigma x)}$$

$$b = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{n(\Sigma x^2) - (\Sigma x)(\Sigma x)}$$

gives $a = 2{,}020$ and $b = -1{,}353$.

These coefficients are used to obtain a predicted value index score y′ for each company in the sample. These predictive values are used to obtain a measure of the goodness of fit of the regression line in the following manner:

The deviation of y from the mean **y** is calculated as $\Sigma(y - \mathbf{y})^2$, where **y** is the mean of the y values (i.e., $(\Sigma y)/n$), and can be explained by x. The second possible deviation of y from the line is given by $\Sigma(y - y')^2$, which cannot be explained by x. The measure of the goodness of fit of the regression line is made by comparing these deviations:

$\Sigma(y - y')^2 \;/\; \Sigma(y - \mathbf{y})^2 = 1814 / 1834 = 98{,}91\%$.

Therefore 98,91% of the variation in index scores can be attributed to random variation or chance and the effect of other variables not incorporated into the model. The remaining 1,1% of the variation in index scores can be attributed to the presence or absence of foreign shareholders. Before discounting foreign shareholders as irrelevant to the prediction of index scores, the remaining statistical tests should be performed as a double check.

The coefficient of correlation $r = \pm\sqrt{0{,}011} = 0{,}105$. This means that there is a positive correlation of just 10,5% between index scores and total assets. This correlation is low, and may be caused by an inaccurate regression line being used for predictions. In order to assess whether the null hypothesis B=0 representing a zero relationship between total assets and index scores is true or false, the standard error of estimate and standard error of the b coefficient need to be calculated.

The standard error of the estimate is:

$$S_e = \sqrt{\frac{\Sigma(y - y')^2}{n - 2}}$$

$$= 3{,}346$$

and the standard error of the b coefficient is:

$$S_b = \frac{S_e}{\sqrt{(x - \mathbf{x})^2}}$$

$$= \frac{3{,}346}{\sqrt{1834}}$$

$$= 0{,}0781$$

Assuming a null hypothesis of B=0, the coefficient b would be $b / S_b = -1{,}353 / 0{,}0781 = -17{,}32$ standard errors from a no-relationship position. This t-value of −17,32 is not less than 2, so total assets could be a significant presictive variable for index scores. However, using t-tables, a t-value of −17,32 would occur at a level of 1 degree of freedom (i.e. with a sample of 3) between the confidence levels of 95% and 98%. For 161 degrees of freedom, based on the sample of 163 companies, the t-values would have to range between 1,282 and 2,576 for statistically accurate predictions to be possible using the regression line calculated.

Therefore index scores are not influenced by the presence or absence of foreign shareholders.

7.4.3 Regression analysis of non-zero index scores and total assets

The data used in the regression analysis, given in Appendix T, includes many companies for which zero scores were obtained. The following table reflects the numbers of zero and non-zero data for each of index scores and foreign shareholders:

	Index scores	Foreign shareholders
Zero	100	151
Non-zero	63	12
Total	163	163

Since this results in the population being significantly skewed, the regression analysis was repeated using only those companies which had non-zero index scores. The data used, and numbers derived for use in the regression calculation with non-zero index scores are set out in Appendix T.

In this regression, non-zero index scores are represented by x, and total assets by y.

The data accumulated in Appendix T gives

Σy = 315 (the sum of observed index scores)

n = 63 (the number of companies in the sample)

Σx = 169 197 016 (the sum of total assets of the 63 companies)

Σxy = 1 337 218 304

Σx^2 = 2 662 810 634 855 230

Substitution of these values in the equations for a and b above gives a = 4,4026 and b = 0,0000002.

These coefficients are used to obtain a predicted value index score y′ for each company in the sample. These predictive values are used to obtain a measure of the goodness of fit of the regression line in the manner used in the previous section:

$\Sigma(y - y')^2 / \Sigma(y - \mathbf{y})^2 = 755 / 864 = 87{,}38\%.$

Therefore 87,38% of the variation in non-zero index scores can be attributed to random variation or chance and the effect of other variables not incorporated into the model. The remaining 12,62% of the variation in non-zero index scores can be attributed to changes in total assets.

The coefficient of correlation $r = \pm\sqrt{0{,}1262} = 0{,}355$. This means that there is a positive correlation of just 35,5% between non-zero index scores and total assets. This correlation is low, and may be caused by an inaccurate regression line being used for predictions. In order to assess whether the null hypothesis B=0 representing a zero relationship between total assets and non-zero index scores is true or false, the standard error of estimate and standard error of the b coefficient need to be calculated.

The standard error of the estimate is:

$$S_e = \sqrt{\frac{\Sigma(y - y')^2}{n - 2}}$$

$$= 19{,}426$$

and the standard error of the b coefficient is:

$$S_b = \frac{S_e}{\sqrt{(x - \mathbf{x})^2}}$$

$$= \frac{19{,}426}{\sqrt{864}}$$

$$= 0{,}6609$$

Assuming a null hypothesis of B=0, the coefficient b would be $b / S_b = 0{,}0000002 / 0{,}6609 = 0{,}0000003$ standard errors from a no-relationship position. This t-value of 0,0000003 is less than 1,282, the t-value associated with a 90% confidence level at 61 degrees of freedom (based on the sample size of 63), so total assets are not a significant predictive variable for non-zero index scores.

This, together with the low correlation of 35,5%, means that non-zero index scores are not influenced by the total assets of the company.

7.4.4 Index scores and the presence of foreign shareholders

In this regression, index scores are represented by x, and foreign shareholders by y.

The data accumulated in Appendix T gives

Σy = 8 (the sum of observed index scores)

n = 12 (the number of companies in the sample)

Σx = 12 (the sum of foreign shareholders of the 12 companies)

Σxy = 8

Σx^2 = 12

Substitution of these values in the equations for a and b above gives $a = 0$ and $b = 0$. Therefore, use of the regression equation $y = a + bx$ will always yield a predicted index score of 0.

The goodness of fit of the regression line is:

$$\Sigma(y - y')^2 \; / \; \Sigma(y - y)^2 \; = \; 34 / 34 \; = \; 100\%.$$

Therefore 100% of the variation in index scores can be attributed to random variation or chance and the effect of other variables not incorporated into the model. There is therefore no relationship between index scores and the presence of foreign shareholders.

7.4.5 Large groups and index scores

Whilst many companies in the mining holdings and mining financial sectors themselves make few disclosures, their subsidiaries often obtained higher scores. This could indicate that disclosures are not made in accordance with a top-down policy.

Refer to Appendix P for a diagrammatic representation of the companies in each of the significant South African groups (Barlow Rand Limited, Anglovaal Holdings Limited, De Beers Consolidated Mines Limited, Gencor Beherend Beperk and Rembrandt Group Limited) and their environmental index scores.

Examination of the appendix reveals that environmental disclosures do not, in fact, appear to be made as a result of a top-down approach. It seems that the environmental disclosures are rather random and inconsistent on a group basis. One would also expect companies involved in similar industries within a group to reflect similar disclosures, including similar environmental ones. Apart from gold companies in the Evander sector of the Johannesburg Stock Exchange, all part of the same group and all with virtually identical financial statements, this was not noted. The lack of consistency on a group basis could be due to individual and localised managements perceiving a need for environmental disclosures, whether to, inter alia, improve a tarnished image, or to indicate a genuine social concern.

An area for further research would be to perform the same exercise in a future period, so as to evaluate whether concern for the environment has spread from group companies up to holding company level.

7.5 Examples of disclosures per index item

7.5.1 Number of disclosing companies

Appendix Q summarises the number of companies in each industry disclosing each index item in 1990/91. The most common environmental disclosure was a balance sheet provision for rehabilitation and restoration, followed by statements of environmental policy or corporate concern, and conservation (viz. rehabilitation and reforestation) of land.

No disclosures in the litigation category were found, therefore this category has been omitted from the tables summarising results. This highlights the disparity between the environmental legislations of South Africa and the USA.

7.5.2 Index scores per subcategory

The results of scores for the index subcategories economic factors, pollution abatement, other information and financial disclosure, are summarised in Appendix R.

Most companies disclosed information in the other information category, with financial disclosures and economic factors being second and third in terms of frequency of disclosure. Pollution abatement was seldom discussed, even in manufacturing or industrial sectors.

Unlike the overall index scores which reflected an increase over time in all cases, some subcategories of those indices showed a decrease over time. For example, the other metals sector reflected disclosures in the economic factors and pollution abatement subcategories in 1986/87, but not in 1990/91.

The mining holding sector also reflected a decrease in pollution abatement score. The only disclosure made was in respect of dust control (Rand Mines Properties Limited, 1986). The swing to zero disclosure in 1990/91 is not as dramatic as it appears - the other 18 companies in the sector made no disclosures in either year surveyed.

7.5.3 Economic factors

Capital expenditures for pollution control equipment and facilities included mention of machinery on order, and quantitative disclosure of budgeted expenditure. Operating costs directly associated with environmental equipment or processes were not disclosed by any of the sample companies.

7.5.4 Pollution abatement

Pollution abatement disclosures consisted of both actual and future estimates of monetary costs, mention of the type of pollution to be abated as well as the extent of the abatement, corporate mission statements highlighting pollution abatement, and the funding of independent research work.

A description of receiving environments, in respect of water discharges, was disclosed only by one company in the coal sector.

7.5.5 Other environmentally related information

Environmental regulations and requirements were discussed by a number of companies, and generally included mine closure standards and draft regulations. Foreign regulations and emissions standards were discussed in one instance.

Environmental policies or statements of company concern for the environment were found to vary from general statements to more specific and attainable goals. Some statements were made in conjunction with quantitative disclosures, such as the number of hectares of mine dumps rehabilitated.

Land reclamation and reforestation (conservation) efforts were disclosed as qualitative statements together with quantitative detail in some instances.

Departments or officers (including environmental audit), and environmental impact studies were not commonly disclosed. However, Eskom's 1991 annual financial statements included the only environmental audit report published by a South African company for the years ended on or before 1990/91.

Disclosures falling within the rehabilitation of the landscape category included the creation of rolling pastures (together with the area involved) , revegetation of mine dumps and related awards received. In one instance, the time frame for future rehabilitation was disclosed.

Recycling of materials, and energy monitoring were found in the gold and paper sectors only. The proportion of recycled waste included in all finished products, and chlorofluorocarbon-reducing technology were also mentioned in some instances.

7.5.6 Financial disclosures

Financial disclosures included accounting policies; balance sheet provisions for environmental expenditure; movements on the balance sheet provision; contingent liabilities; amounts in the cash flow statement or the income statement; and an asset for contributions receivable from a restoration fund.

These disclosures were found on the face of the financial statements, in the accompanying notes, as well as in other reports contained in the discussion section of annual financial statements. No separate stand-alone environmental statements were identified, however, environmental issues were sometimes allocated a separate sub-section of a social responsibility report.

7.6 Industry-specific disclosure trends

Types of disclosures made by companies in each industry will be discussed in this section, as this will enable inter-industry comparisons to be made.

7.6.1 Coal

Of the seven companies in this sector, only Anglo Transvaal Collieries Limited (1990) made no disclosures. The standard and extent of reporting in this industry is generally higher than that found in other industries, as reflected by the relative industry rankings discussed in section 7.3. For this reason, the types of disclosures found in annual reports of coal companies will be discussed under the headings suggested by Wiseman's (1982) index categorisation.

Economic factors

Anglo American Coal Corporation Limited (1991) was the only company in this sector to disclose past and current capital expenditure:

"The truck and shovel fleet on order for pre-stripping overburden will assist in enhancing the rehabilitation standards in the future by the selective dumping of soil and overburden".

Pollution abatement

Descriptions of receiving environments in respect of water discharges included the following:

Research is being conducted to "determine the contributions of surface water and ground water to the salt load and flow of the river and will eventually culminate in a water management strategy for the catchment area. The group is assisting in this programme in the belief that it will ultimately enable us to understand and manage our water resources optimally" Witbank Colliery Limited (1990).

Rehabilitation of the landscape was mentioned by 5 out of the 7 companies in the sample. These disclosures included:

"rolling pastures have been created on the rehabilitated land and an area of approximately 250 square hectares has been leased to a local farmer for cattle grazing" (Anglo American Coal Corporation Limited, 1991).

Water quality requirements are still to be met (Vierfontein Colliery Limited, 1991).

"Rehabilitation of dragline and supplementary stripping dump sites was continued as part of opencast operations. The revegetation effort made good progress and the opencast was rewarded by winning a Natural Resources trophy" (Wankie Colliery Co. Limited, 1991)

"Rehabilitation on the opencast mines is proceeding according to plan with the exception of a few areas where, as a result of mining constraints, the rehabilitation programme has been delayed. The objective is to eliminate all backlogs in rehabilitation by 1992." (Witbank Colliery Limited, 1990).

It should be noted, however, that surface rehabilitation of open cast coal mines is required by statute, therefore disclosures of this type can reasonably be expected from all companies in this sector.

Land reclamation and reforestation was disclosed in one instance:

"A comprehensive tree-planting programme is in progress, using both indigenous and exotic species, with some 8 000 trees being planted on rehabilitated areas during the year", and

"The Group acquired additional land during the year ... and has implemented a modest afforestation programme." (Anglo American Coal Corporation Limited, 1991)

Other information

Regulations and requirements, specifically mine closure standards, were discussed by Anglo American Coal Corporation Limited (1991) and Vierfontein Colliery Limited (1990). New draft regulations governing the rehabilitation of mined land were mentioned by Witbank Colliery Limited (1990).

The following comment on the Natal Anthracite mine closure was made:

"An investigation by consultants to the Department of Water Affairs into the various sources of pollution in the Swart Umfolozi and Mkuzi river systems and the best means of dealing therewith is nearing completion" (Anglo American Coal Corporation Limited, 1991).

Anglo American Coal Corporation Limited (1991) also noted that "pollution control and surface rehabilitation work is well advanced" in respect of closed collieries. Other statements of concern included the following:

"Management places a high priority on the protection of the environment and comprehensive standards which have been set are complied with in the rehabilitation of land disturbed by the group's mining activities and the prevention of air and water pollution" (Witbank Colliery Limited, 1990).

One photograph caption stated:

"The Amcoal Group endeavours to maintain a balance between mining and the environment. This dam, with ample bird life, is situated in the mining area at New Vaal colliery."

Disclosures of departments or officers for environmental control, and environmental impact studies included a statement by Witbank Colliery Limited (1990) on the implementation of Integrated Environmental Management

"which ensures that environmental matters are considered at all stages of decision making and operations. An active programme, part of ongoing participative management, has been introduced to bring an environmental awareness to all levels of employees".

Financial disclosure

Perhaps the best financial disclosure in the coal industry was made by Trans-Natal Coal Corporation Limited (1990). The following are extracts from the 1990 annual report:

"*Accounting policy*
Pollution control, rehabilitation of surface areas and closure costs
Provision is made for the future liability resulting from mining operations, and is based on the estimated cost over the expected life of each mine."

Director's report
"Trans-Natal Coal Corporation Pollution Control and Rehabilitation Trust Fund
This trust fund was established in March 1988 to hold the contributions of Group companies for rehabilitating the environment, preventing pollution and to meet the ultimate closure costs. At 30 June 1990 accumulated contributions to the fund and interest received, net of recoveries amounted to R38,2 million (1989: R21,0 million)."

Cash Flow Statement	1990 R000s	1991 R000s
Operating income	259.4	137.1
add: non-cash items		
Rehabilitation Provision	42.3	35.1
deduct: payments for rehabilitation	28.9	23.2

The change in working capital was calculated using creditors net of the provision for rehabilitation.

Notes to the financial statements
Note 19: Pollution, rehabilitation and closure provision (note 18)

Opening balance on provision	35.7	23.8
Amounts provided during the year (note 1(k))	42.3	35.1
deduct: costs incurred and contributions	(28.9)	(23.2)
deduct: joint venture contribution(included in mining assets) (note 14)	(1.7)	-
	47.4	35.7

A note similar to that of Trans-Natal's appeared in the directors' report of Anglo American Coal Corporation's 1991 annual report:

"*Pollution Control Fund*
The Anglo American Corporation of South Africa Limited Coal Division Pollution Control Fund was established for the purpose of holding the contributions of those companies that wished to provide, during the lives of their mines, for the cost of pollution control and surface rehabilitation to be incurred when those mines closed. At 31 March 1991, the Group's contributions, together with the fund's net income, totalled R44 552 000 (1990: R33 478 000)."

On balance, it can be seen that the majority of disclosures made by companies in the coal sector of the Johannesburg Stock Exchange were non-financial.

7.6.2 Diamonds

Of the seven companies listed in this sector, only De Beers Consolidated Mines Limited made environmental disclosures of any kind.

This was in the form of a statement of concern for the environment in a Community Investment report included in the annual report:

"The company remains committed to the conservation of indigenous flora and fauna on its properties in South Africa. A significant recent advance in this

area has been the establishment of the Venetia Limpopo Nature Reserve, an area totalling some 30 000 hectares. In addition, some 35 000 hectares on the west coast at Kleinzee have been set aside for wildlife conservation. These areas include a number of important habitats with a high conservation priority. Benfontein near Kimberley became the second De Beers property to be registered as a Natural Heritage Site."

No disclosures of economic factors associated with environmental control, pollution abatement, or financial information were made.

7.6.3 Gold

7.6.3.1 Gold - Wits and others

With 27 companies listed in this sector, the disclosure results are extremely poor, especially when compared with the disclosures made by companies in the coal sector. Only 8 companies made environmental disclosures.

Eastern Transvaal Consolidated Mines Limited (1991) was the only company to disclose future estimated capital expenditure specifically for the purposes of environmental control measures.

In the pollution abatement category, Vlakfontein Gold Mining Co. Limited (1991) was the only disclosing company. The technical adviser's report mentioned that costs of R2 million were incurred "to meet rehabilitation requirements". A refund of this amount was, however, received from the Gold Fields Dust and Water Control and Surface Restoration Fund.

As far as financial disclosures are concerned, five companies disclosed provisions for environmental restoration, but only one of these reflected movements on the provision account.

Witwatersrand Nigel Limited (1991) disclosed "a contingent liability of approximately R2 500 000 in respect of the re-grassing of the mine dumps".

7.6.3.2 Gold - Evander

The annual reports of all four companies in this sector included disclosure of amounts paid to a fund for environmental restoration or rehabilitation, together with their balances in the fund. These are all companies in the Gencor group, which probably explains the similarity in the pattern of disclosure.

7.6.3.3 Gold - Klerksdorp

Three out of six companies disclosed balances in a rehabilitation trust fund. These are Buffelsfontein Gold Mining Co. Limited (1991), Haartebeesfontein Gold Mining Co. Limited (1991) and Stilfontein Gold Mining Co. Limited (1990). These companies, also all members of the Gencor group, all stated that no payments to the fund were made during the year.

7.6.3.4 Gold - OFS

Free State Consolidated Gold Mines Limited (1991) was the only report in the gold industry to contain pollution abatement and energy savings disclosures. "(C)ommodities such as timber are increasingly being recycled and electricity demand is being more closely monitored". One point was awarded for each of recycling and energy monitoring.

Another company (out of a total of 10) disclosed an environmental provision account in its balance sheet, while another two mentioned that contributions to trust funds would have to be made in future.

7.6.3.5 Gold - West Wits

Out of 12 companies, two made disclosures:

Elandsrand Gold Mining Co. Limited (1991) mentioned the use of recycled materials (mainly timber), energy savings measures, and company concern for the environment.

Blyvooruitsicht Gold Mining Co. Limited (1991) discussed environmental regulations and requirements, and showed a provision for future environmental restoration.

7.6.3.6 Gold - Curtailed operations

No disclosures were made, however, where mining operations have been curtailed, one could reasonably expect disclosure of closure standards and compliance with those standards.

For the gold sector overall, 18 companies out of a total of 62 made environmental disclosures. The quality of disclosures, indicated by index scores and relative ranking of the gold industry disclosure, is amongst the weakest of those industries surveyed. This is contrary to expectation since gold mines, like coal mines, are governed by environmental legislation. For example, the Mines and Works Act (number 27 of 1956) with associated regulations, and the Environment Conservation Act (number 73 of 1989).

7.6.4 Copper

Out of four companies, only Palabora Mining Company Limited made environmental disclosures. Extracts from the 1990 annual report follow:

"The company aims for the highest standards of efficiency, safety and environmental control throughout the organisation."

"*Environmental control*
Attention to environmental control issues continued and the department was further expanded during 1990. Routine monitoring of dust, radiation, gases and water continued throughout the year. The following were among the more important projects completed:

- The implementation of a comprehensive dust monitoring system in terms of new legislation.
- The rehabilitation of rock waste, magnetite and tailings dumps by over-tipping with vermiculite waste, followed by hydroseeding. In addition, more than a thousand trees were planted, with a further million seedlings being developed for future planting.
- The funding of research work by Kruger National Park, Onderstepoort Veterinary Research Unit, and the University of Pretoria to investigate possible toxicity effects of copper on game and cattle.

Environmental control matters will continue to be a management priority in future years."

7.6.5 Manganese

Samancor Limited's 1991 annual report included the following statements:

"The group is also committed to investing time, money and expertise on minimising the environmental impact of its operations"

The Chairman, in his review, mentioned that the

"(c)onstruction of an additional bag filter plant at the Ferrometals ferrochrome plant has commenced to minimise the risk of environmental pollution".

The other company in this sector, Associated Manganese Mines of S.A. Limited, did not include environmental disclosures in their 1990 annual report.

7.6.6 Platinum

Of 8 companies in this sector, only Impala Platinum Holdings Limited made environmental disclosures. Their 1991 annual report included an accounting policy note:

"*Pollution and environmental control*
Provision is made for anticipated liabilities which may arise for pollution and environmental control. Expenditure is charged against income, as incurred, net of any provision."

No details of any expenditure and the balance of the environmental provision were, however, given.

7.6.7 Tin

Rooiberg Tin Limited's 1990 annual report contained no environmental disclosures, however Union Tin Mines had fairly detailed financial disclosure in their 1990 annual report:

- an asset, reflecting amounts due from the GF Dust and Water Control and Surface Restoration Fund, in the balance sheet;
- contributions to the above fund, and share of income accrued on the contributions due from the fund in the income statement;

- these contributions reflected in cash effects of financing activities and cash utilised for operating activities sections of the cash flow statement; and
- recovery of closure costs due from the fund netted off against a non-distributable reserve in the notes to the financial statements.

7.6.8 Other metals and minerals

Out of 11 companies, 3 made disclosures:

Consolidated Murchison Limited disclosed balances and movements on the grassing of dumps provision for the 1990 year.

The Griqualand Exploration and Finance Company Limited (1990) described their rehabilitation of mined land, and disclosed movements and balances on the Rehabilitation Trust Fund in the Chairman's Review. Environmental expenditures for the year were also disclosed in the cash flow statement and income statement.

Msauli Asbes Beperk (1990) also discussed rehabilitation projects, and disclosed the amount provided for environmental restoration in the income statement.

7.6.9 Mining holdings

Out of 20 companies, 7 made disclosures. Middle Witwatersrand (Western Areas) Limited (1991) made the only disclosure of future estimated capital expenditure.

The rehabilitation of mined land, environmental regulations, company concern for the environment, an environmental accounting policy, and a contingent liability were each disclosed just once.

Minorco Societe Annonyme's 1991 annual report included:

"As a mining company in the 1990's Minorco is mindful of the challenges imposed by ever increasing environmental standards and public awareness and is committed to responsible operating standards in its business and new developments.

Environmental regulations require that Hudson Bay must complete the sulphur and particulate emission reduction programme at the metallurgical complex by January 1994. The project which is currently estimated to cost C$ 187 million will also achieve improved productivity and a reduction in operating expenses." European emission control standards were also mentioned in this annual report.

Balance sheet provisions were noted in three annual reports.

7.6.10 Mining houses

Out of 10 companies, 5 made disclosures. These included discussion of rehabilitation of the landscape, land reclamation and reforestation, type and manner of solid waste disposal, current capital expenditure on pollution abatement technology, planned installations, expressions of company concern for the environment, and financial information (most frequently provisions for environmental restoration).

7.6.11 Industrial - chemicals and oil

Out of a total of 8 companies, 6 made environmental disclosures.

Chemical Services Limited mentioned that "(t)he company has budgeted to spend R2 million in order to upgrade the effluent plant at the Chloorkop factory in 1991". This was the only disclosure of future estimated capital expenditure in the sample.

Beautification, rehabilitation of the landscape, and land reclamation and reforestation were each mentioned once.

Environmental policy statements were made by 4 companies. Omnia Holdings Limited included a feature on cycads as an endangered species, without mentioning corporate concern for the environment.

Sasol Limited devoted a page of the annual report to environmental affairs. This was also one of very few instances in which a company explicitly accepted its accountability in respect of environmental issues. "We accept that conservation of our environment is not an option but an obligation".

7.6.12 Paper and packaging

The total number of companies in this sector is 22, only 6 of which made environmental disclosures of any kind.

The highest scoring company was Sappi Limited (1991) with 20 points. All disclosures were made in the "discussion" section of the annual report - none occurred in the financial statements section. Selections from the annual report follow:

The Review of Operations included the following information:

- mill effluent in the pipeline near the Tugela river contained
- a wash filter, costing R10 million, that will reduce volumes of contaminants in effluent has been installed and is to be commissioned
- work will soon begin on refurbishing and upgrading air pollution control equipment to reduce particulate emissions
- recycled waste comprises 25% of the furnish of all packaging grades

The Social and Environmental Responsibility statement mentioned that:

- "Sappi's research and development continues to focus on better utilisation of our natural fibre resources and on environmental protection. ... Sappi pioneered and patented the oxygen bleaching process for pulp, which drastically reduces the need to use chlorine as a bleaching agent. This process has now become mandatory for all modern bleached kraft pulp mills in the developed world."

- Sappi is working with other companies on research to eliminate the use of chlorine in the pulping process

- "Pollution abatement remains one of our priorities and several capital projects have been aimed at upgrading our mills. At Tugela an R8 million pipeline was installed which eliminated the release of effluent into the Mandini river and reduced the odour levels in the Mandini village."

- Sappi has taken steps to avoid a repetition of the 1990 spill, by installing an additional system of buffer dams at Ngodwana at a cost of R5 million. "Emergency procedures have been extensively revised and strengthened."

In retrospect, however, it appears that these disclosures were made primarily as a result of significant adverse publicity associated with chemical spills into rivers by Sappi mills. This is further supported by the fact that the 1992 annual report hardly made mention of environmental issues.

Holdains Limited (1990) made disclosures similar to Sappi Limited's:

"We are extremely conscious of the importance of protecting our environment and are aware of concerns about certain forms of packaging materials. There is an international move to recognise the degradability and easier recyclability of paper based products. In line with this trend our dependency on plastic products is now less than 15% of turnover. In addition, paper is recycled extensively within the group and Holdains is the fourth largest recycler of paper in the Republic. We intend to remain vigilant regarding the world trends in relation to recycling and degradability as these two items will impact on our business in the future."

Sun Packaging Holdings Limited (1990) stated in their mission statement that they aim to "provide environmentally safe packaging through the use of blowing agents, recyclable materials and the development of bio-degradable foam products."

They also stated that "(a)ll of Sunpak's factories produce recyclable and environmentally safe products free of ozone-depleting chlorofluorocarbons (commonly termed CFC's)".

"As the activity of man is causing more and more pollution, part of the company's mission is to produce materials which will not add to the problem but will help solve it by developing a "nature-friendly" polymer. The term "nature-friendly" was coined to describe materials which will disappear from sight under the attack of normal climatic conditions like wind, water, sunlight and bacterial action. It is expected that this polymer will be available at the end of 1991. Not only will the company draw on its in-house and Sekisui expertise but research contract negotiations are also being concluded with universities, both local and overseas, to achieve this objective."

7.6.13 Steel and allied

Out of 4 companies, only Iscor Limited (1991) made environmental disclosures. These consisted of an expression of corporate concern for the environment, and the use of environmental impact studies.

7.6.14 Transportation

Out of 9 companies in this sector, 2 made disclosures in the form of company concern for the environment.

Laser Transport Holdings Limited expressed the following corporate goals:

- "To provide an attractive financial return to shareholders by improving the value of their investment over time in a sustainable and socially acceptable manner", and
- "To be aware of its social and environmental responsibilities"

7.6.15 Electricity

Eskom included an environmental audit report in their 1990 annual report - the first of its kind in South Africa. This report is reproduced in Appendix S.

The Chief Executive's Report stated that

"Eskom acknowledges its role as a major corporate citizen with diverse activities, some of which have the potential to affect the natural environment adversely. We accept our responsibility to integrate consideration for the environment into our business practices. To this end we have set ourselves the goal of achieving a net positive impact on the natural environment and our programmes have led to an increased environmental awareness throughout the organisation. To measure the extent of our success, we have agreed that an independent environmental audit be conducted and published."

The Focus on Key Areas in the annual report includes a section entitled The Natural Environment. Extracts from this section follow:

"Eskom has set itself the ultimate goal of having a net positive impact on the environment. To assess the degree of success in achieving this goal, the organisation has become one of the few utilities in the world to subject itself to an external and independent environmental audit over three years and to publish the results.

The 1990 M-Net/South African Nature Foundation (SANF) national trophy for corporate performance on environmental management was awarded to Eskom.
In March 1990 Eskom held a workshop entitled "The business of environmental management - strategies for the 1990's" and a seminar entitled "Environmental responsibility - the business dimension", hosting international speakers.
On Arbor day Eskom donated and planted a total of 12 000 trees countrywide.
A scientific forum was held for the first time to submit findings on air quality to other scientific organisations and experts. Cooperation with bodies such as the CSIR, the Department of Health and Population Development and academic institutions is envisaged on a number of major projects."

Smoke emissions at the Kriel and Hendrina power stations, before and after modification, were discussed, together with bar graphs indicating related legal emissions levels.

7.7 Conclusion

Index scores obtained using the various index lists indicated an improvement in the quality of environmenatal disclosures from 1987/87 to 1990/91. The modified Wiseman index yielded the highest index scores, both on an industry basis and in aggregate over the entire sample of companies. This was due to the fact that financial disclosures do not fall within any of the Wiseman index categories.

Changes in relative industry ranking were observed between the indices used. These changes were caused by the use of different index item lists on the one hand, and different weightings on the other. Firstly, the Wiseman and modified Wiseman indices utilised the same weighting, but different index items. Secondly, the Cooke index weighting differed from that of the modified Wiseman index, but the same index items were used.

Comparison of the Wiseman index computed using South African data with those of Wiseman's (1982) American study revealed significant differences between those countries' respective environmental legislation and the enforcement thereof. Furthermore, the lack of an independent South African environmental monitoring body, similar to the American Council of Economic Priorites, was identified as a contributing factor towards the difference in index scores.

Contrary to expectation, total assets and/or the presence of foreign shareholders were not found to be significant predicting variables for index scores. Due to the large number of zero index scores and zeros denoting the absence of foreign shareholders, the regression analysis was repeated for non-zero index scores and total assets, and for index scores where the "indicator" for foreign shareholders was non-zero. As before, total assets and the presence of foreign shareholders were not found to be a significant predicting variable for non-zero index scores.

Types of disclosures observed varied according to industry. The standard of reporting in the coal sector was relatively high, as might be expected from its relative ranking of 1 in 1991. Other mining sectors did not display the same extent or variety of disclosures. Predominant disclosures were in the form of mission statements and various financial disclosures, especially provisions for environmental rehabilitation.

Disclosures made by companies in the mining holdings and mining houses sectors were disappointing, especially since many of these companies hold investments in the mining companies discussed above. This lack of a top-down approach to environmental reporting became apparent from the analysis of index scores on a group basis.

Industrial companies disclosed different information, notably pollution abatement (together with current and estimated future abatement equipment capital expenditure), environmental policy statements, and research and development projects. One environmental audit report was noted.

Whilst the dislosures noted during the survey, and summarised in section 7.6, are encouraging in that some companies seem to be indicating at least some concern for the environment, the quality of these disclosures, as measured by the disclosure indices, is extremely poor. There is certainly scope for considerable improvement in the quality of future environmental disclosures.

CHAPTER 8: CONCLUSION

The objectives of this dissertation were fourfold - firstly (objective 1a) to review the accounting, economic and legal literatures in order to propose an environmental reporting model. Secondly, (objective 2a) to extend an existing indexing method for the purposes of objectively evaluating environmental disclosures made by selected South African companies. The third objective (2b) was to assess whether there has been an improvement in the quality of disclosures over a five year period, and fourthly (objective 2c), to assess whether quality is influenced by company size or the existence of significant foreign shareholders.

A barrier to the reporting of environmental information by companies is the lack of a recognised reporting model or framework for this information. The first objective of this dissertation, involving the critical review of the economic, legal and accounting literatures, was met by chapters 2 to 4. These reviews formed the basis for the recommendations for a suggested environmental reporting model made at the end of chapter 4.

This suggested reporting model is that of compliance with legal environmental standards, together with the provision of other non-legal information. It was suggested that this other information should consist of at least a corporate environmental mission statement or statement of environmental concern, current and planned capital expenditures on environmental protection measures or equipment, accounting policies and other relevant financial information (such as contingencies, provisions, cash expenses etc.). These disclosures could be fleshed out with any other information management may wish to include in the annual report.

The survey of South African financial statements highlighted the need for such a compliance with legal environmental standards report - out of a total of 163 companies surveyed, only one disclosure of compliance with legal standards

was made. This was Eskom's reduction in smoke emissions at two power stations to below the maximum legal limits.

Despite the lack of a recognised reporting framework, environmental disclosures in annual financial statements, the traditional vehicle of communication between a company and interested parties, are becoming more common-place. The survey of South African annual financial statements in this dissertation supported the view that environmental disclosures are generally ad hoc, and are generally positive - very few negative disclosures, which could be damaging to the discloser, are volunteered.

Environmental disclosures generally do not provide the user of annual financial statements with an indication of the extent of the entity's problems. The action already taken is usually reported, but the action that may well prove necessary in future periods is not communicated. Furthermore, the quality of environmental disclosures is extremely difficult to assess, and comparisons between companies and industries are also hard to perform. The need for an objective measure of the quality of environmental disclosures prompted the second purpose of this dissertation - namely, to provide such a measure by extending an existing indexing technique.

Wiseman's (1982) indexing approach, discussed in chapter 6, was extended in chapter 7 (this satisfied Objective 2a). This index was applied to environmental disclosures made in South African annual financial statements.

Two weightings were used - the first ranging from 0 to 3 (0 for non-disclosure, positive scores dependant on the degree of specificity of the information), and the second of 0 or 1 (1 for disclosure, 0 for non-disclosure). Two weightings were used since, theoretically, different weightings could yield markedly different results.

Industry averages were computed in order to compare disclosure trends on an industry basis, and relative industry rankings were found to differ, depending on the weighting used. Comparison of the results of using different weightings were compared and differences were not found to be significant. The relative rankings of companies at the extremes, relatively good disclosure versus non-disclosure, remained almost identical.

Objective 2b involved determining whether or not an increase in the quality of environmental disclosures between 1986/87 and 1990/91 annual financial statements had occurred. As expected, such an increase in quality, as measured by disclosure indices, was demonstrated. This increase was found to be independent of the items used in the index, and the index weightings used.

Although an improvement in disclosure quality was noted, it must be emphasised that the quality of environmental disclosures by South African companies is poor. This is supported by the comparison of this South African survey with Wiseman's American survey, which revealed a large disparity between South African and American disclosure scores for the oil, steel and paper industries.

Analysis of the index scores on a group basis revealed that environmental disclosures were not made in terms of a top-down policy, but rather on an ad hoc basis. In certain instances, companies in the same industry and belonging to the same group had almost identical disclosures. This similarity was on the horizontal, rather than vertical, level. For example, Leslie, Grootvlei, Bracken and Kinross are all Gencor group companies in the gold sector, and all had almost identical disclosures. The apparent lack of consistency between environmental disclosures within the same group (on a vertical basis) could indicate the low priority placed on environmental issues by top level managements. Another explanation could be that management at the "coal face" are more aware of the environmental impacts of their operations.

Contrary to expectation, no relationship between index scores and the total assets and/or the presence or absence of foreign shareholders could be found. Furthermore, no relationship between non-zero index scores and total assets, or between the presence of foreign shareholders and index scores could be found. With the present moves towards the lifting of sanctions against South Africa, and the consequent opening up of foreign markets to South African products, producers may not be able to ignore foreign environmental standards for much longer. International pressure may well be brought to bear on the South African legislature to introduce more stringent environmental standards and penalties for non-compliance.

This is supported by analysis of South African and USA disclosure trends. Comparison of the results of applying the Wiseman index to companies in the oil, paper and steel industries in both the United States of America and South Africa, revealed a significant disparity in index scores between countries. This disparity is exacerbated by the time period between the annual financial statements used in the respective studies. The American study was based on annual financial statements ranging between 1972 and 1976, whereas the South African study considered 1990 or 1991 annual reports. It appears that the disparity in quality of environmental disclosures could be due to differences in the content and enforcement of environmental legislation.

It can be argued that the above comparison between the American and South African situations tends to support the view that without legal environmental standards, there will be little progress towards or incentive for disclosures of environmental information by companies. This relationship has not, however, been demonstrated and therefore other factors such as public perceptions cannot be discounted.

At present, South Africa is undergoing major political changes, and the country is faced with third world needs, including the need for basic health care, education, housing and employment. Until these basic needs of the majority of

the country's population are catered for, the development of improved environmental legislation may well be placed on hold. This should not, however, be used by polluters as an excuse for not reporting environmental performance - the extent of compliance or non-compliance with relevant existing legislation can be reported. Furthermore, the indexing approach utilised in this study can be used as an objective tool to aid the assessment of any such disclosures.

The proposals in this dissertation are by no means a final solution to the problem of assessing which environmental disclosures should be made, and how to assess their quality. The very nature of environmental issues is such that real and meaningful progress towards a solution can only be made if a holistic and multi-disciplinary approach to designing and enforcing legal and financial environmental reporting standards is adopted.

APPENDIX A: SELECTED ENVIRONMENTAL STATUTES

Resource conservation
GENERAL
Environment Conservation Act (73/1989)
National Parks Act (57/1976)
Mountain Catchment Areas Act (63/1970)
Forest Act (112/1984)
Conservation of Natural Resources Act (43/1983)

Nature Conservation Ordinance (Natal) (15/1974)
Nature Conservation Ordinance (Orange Free State) (8/1969)
Nature and Environmental Conservation Ordinance (Cape) (19/1974)
Nature Conservation Ordinance (Transvaal) (12/1983)

RENEWABLE RESOURCES
Animals Protection Act (71/1962)
Sea Fishery Act (12/1988)

NON-RENEWABLE RESOURCES
Mining Rights Act (20/1967)
Precious Stones Act (73/1964)
Mines and Works Act (27/1956)
Tiger's Eye Control Act (11/1977)

2. Planning and spatial aspects
GENERAL
Environment Conservation Act (73/1989)
Physical Planning Act (88/1967)
Lake Areas Development Act (39/1975)
Subdivision of Agricultural Lands Act (70/1970)
Advertising on Roads and Ribbon Development Act (21/1940)
National Building Regulations and Building Standards Act (103/1977)
MARINE SPECIFIC
Sea-Shore Act (21/1935)
Territorial Waters Act (87/1963)
PROVINCIAL ORDINANCES
Land Use Planning Ordinance (Cape) (15/1985)
Town Planning Ordinance (Natal) (27/1949)
Town Planning and Townships Ordinance (Transvaal) (15/1986)
Townships Ordinance (Orange Free State) (9/1969)

3. Pollution and waste management
LAND
Environment Conservation Act (73/1989)
Conservation of Agricultural Resources Act (43/1983)
Prohibition on Dumping of Rubbish Ordinance (Orange Free State) (8/1986)
Prevention of Environmental Pollution Ordinance (Natal) (21/1981)

APPENDIX A (continued)

AIR
Atmospheric Pollution Prevention Act (45/1965)
Mines and Works Act (27/1956) (Regulations)
Local Authority By-laws

FRESHWATER
Water Act (54/1956)

NUCLEAR, HAZARDOUS, TOXIC AND HEALTH-RELATED ASPECTS
Nuclear Energy Act (92/1982)
International Health Regulations Act (28/1974)
Health Act (28/1974)
Hazardous Substances Act (15/1965)
Medicines and Related Substances Control Act (101/1965)
Foodstuffs, Cosmetics and Disinfectants Act (54/1972)
Animal Slaughter, Meat and Animal Produce Hygiene Act (87/1967)
Animal Diseases Act (35/1984)

NOISE
Environment Conservation Act (73/1989)
Machinery and Occupational Safety Act (6/1983)

4. Statutes applicable to marine pollution
MARINE SPECIFIC
The Dumping at Sea Control Act (73/1980)
Prevention and Combating of Pollution of the Sea by Oil Act (6/1981)
The International Convention Relating to Intervention on High Seas in Cases of Oil Pollution Act (64/1987)
International Convention for the Prevention of Pollution from Ships Act (2/1986)
Sea Fishery Act (12/1988)
Merchant Shipping Act (57/1951)

GENERAL
Water Act (54/1956)
Mining Rights Act (20/1967)
Precious Stones Act (73/1964)
Mines and Works Act (27/1956)
Physical Planning Act (88/1967)
Health Act (63/1977)
International Health Regulations Act (28/1974)
Sea-Shore Act (21/1935)
South African Transport Services Act (65/1981) - (Now repealed but regulations made under it still apply)
Hazardous Substances Act (15/1973)
National Monuments Act (28/1969)
Legal Succession to South African Transport Services Act (9/1989)
Saldhana Bay Harbour Construction Act (29/1973)

APPENDIX A (continued)

Nuclear Energy Act (92/1982)
Lake Areas Development Act (139/1975)
National Parks Act (57/1976)

Source: Glazewski (1991b)

APPENDIX B: ENVIRONMENTAL OBLIGATIONS AND THE INFORMATION NEEDS OF "INVISIBLE" STAKEHOLDERS

	Past obligations	Present obligations	Future obligations
"Green" consumers	Data to assess degree of corporate responsibility accepted	Information on "full resource cost" of product	Information on potential recycling, disposal costs
Environmental activists	Analysis of extent of damage, extent of remediation required	Analysis of extent of damage, of extent of conservation practiced	Controls/ commitments to prevent future damage (basis of monitoring)
Employees	Health hazards	Health hazards	Health hazards, employment levels at varying levels of sustainability
Communities in impact zone	Progress in treating past contamination, health risks	Risks, effluent, relative to corporate commitments	Costs and benefits of varying levels of sustainability

Source: Rubenstein (1991, 38).

APPENDIX C: ENVIRONMENTAL VERSUS TRADITIONAL OBLIGATIONS

	Traditional obligations	Environmental obligations
Time span involved	Relatively well-defined, short to medium-term	Ill-defined, more long-term (inter-generational)
Degree of interdependence	"Self-contained"	High degree of interdependence - what other parties do or experience is critical
Ease of estimation	Relatively easy to estimate	Inherently difficult to estimate
Stewardship concept	Traditional private property, share-holder stewardship concept	Common property, stakeholder stewardship concept
Contractual basis	"Explicit" contract between known transacting parties usually two-party contract with well-defined rights, benefits and obligations	Implicit social contract with unknown, "invisible" parties, usually multi-faceted contract with ill- defined rights, benefits and obligations
Valuation basis	Fair-market transaction values	Court-arbitrated values
Philosophical orientation	Economic orientation	Recognition of noneconomic impact on other habitats
	Anthropocentric(centred on human beings)	Multi-species orientation
	Entity-specific	Ecosystem-specific

Source: Rubenstein (1991, 38).

APPENDIX D: MARLIN'S POLLUTION CONTROL AND EMISSIONS REPORTS

State-of the-art pollution control report for Ideal Paper Co: Production, water use and pollution control of the mill.

LOCATION	PRODUCTION (tons per day)		WATER USE (millions gallons per day)	POLLUTION CONTROL ADEQUACY				
	Pulp	Other		Water			Air	
				Primary	Secondary	Tertiary	Gas and odour	Particulate
Mill A	1600	1750	89	yes	yes	no	yes	no
Mill B	1200	970	95	yes	1973	no	yes	no
Mill C	1200	1100	82	yes	1973	1973	1974	yes
Mill D	610	840	40	1974	1975	no	no	yes
Mill E	0	1395	61	yes	-	-	-	yes
Total	4610	6055	367	80%	25%	0%	50%	60%
Total pulp production adequately controlled				80.8%	34.7%	0%	60.7%	39.3%

Note: Presently adequate state-of-the-art pollution controls are indicated by "yes"; inadequate controls by "no". A dash means that equipment is not needed. Where adequate equipment is being installed, the expected year of completion is indicated.

Source: Marlin (1973, 43).

APPENDIX D (continued)

Sample net pollution emissions and Federal Standards, by type of pollutant

	Company A (NSSC ulp)	Company B (Kraft pulp)	Company C (Tissue manufacturer)				
			No 1 White Tank	No 1 Sewer	Pulping area floor drain	Federal Drinking Water Standards	
						Drinkable	Permissable
Production (tons per day)	70	550	170	170	170	-	-
Flow (thousands gallons per day)	5000	1900	127	410	23	-	-
A Biochemical oxygen demand	344	18	93	156	234	-8	-14
Chemical oxygen demand	1742	110	46	254	573	?	?
Solids, dissloved	1454	478	3	114	28	200	500
Solids, suspended	264	21	16	170	399	-6	-10
B. Colour	40	220	0	12	7	10	75
Coliform bacteria	760000	20	0	0	1900	100	10000
Phenols	45	0	2	5	4	0	0.001
Sulphate	9	186	-0.8	0.2	3	50	250
Chloride	15	388	0.7	0.5	3	25	250
Copper	15	0	35	30	25	0	1
Lead	0	0	-12	-9	2	0	0.05
Zinc	-50	0.02	1498	20	22	0	5

Note : Question mark means missing source figures. Dash denotes not applicable.

Source: Marlin (1973, 45).

APPENDIX E: ERNST AND ERNST SOCIAL RESPONSIBILITY DISCLOSURE SURVEY (1978)

Examples of tables used to summarise the results of the survey:

		%
Disclosure type:		
Monetary and non-monetary quantification	124	28%
Non-monetary quantification only	75	17%
Monetary quantification only	61	14%
No quantification	186	41%
Companies making quantified disclosure:	260	
% of disclosing companies		59%
% of Fortune 500 companies		52%

Quantification of Social Responsibility disclosure

	Nonmonetary				*Monetary*			
General category	199X		199Y		199X		199Y	
	no	%	no.	%	no.	%	no.	%
Environment								
Energy								
Fair Business Practices								
Human Resources								
Community Involvement								
Products								
Other Disclosures								

Number of pages devoted to SR disclosure

	199X		199Y	
Number of pages	no.	%	no.	%
.01 - .25	226	51	234	51
.26 - .50	71	16	100	22
.51 - .75	39	9	47	10
.76 - 1.00	38	8	26	6
greater than 1.00	72	16	49	11
TOTAL	446	100	456	100
AVERAGE		.56		.43

APPENDIX E (continued)

Location of SR disclosures

Location in annual report	199X no.	199X %	199Y no.	199Y %
President's letter				
Separate section of report (at least paragraph heading)				
Other section of annual report				
Separate booklet sent with annual report				

Source: Ernst and Ernst (1978).

APPENDIX F: SINGHVI AND DESAI INDEX OF DISCLOSURE

	Items of information	*Weight*
1.	Comparative Income Statement for 2 years	4
2.	Comparative Balance Sheet for 2 years	4
3.	Statement of reconciliation of retained surplus	3
4.	Statement of cash-flow (or source and application)	3
5.	Summary of important financial statistics	
	10 years = 3 points 6-9 years = 2 points 4-5 years = 1 point	3
6.	Method of inventory valuation	1
	Basis of inventory valuation	2
7.	Sales breakdown by division or by individual companies in a consolidated statement	3
8.	Method of depreciation	3
9.	Description of type of capital expenditure planned	3
10.	Capital expenditure amount for current year	3
11.	Research expenditure amount for current year	3
12.	Statement of gross and net property accounts	2
13.	Sales broken down by customers or industry served	2
14.	Sales separated by major product lines	2
15.	Discussion of major factors affecting future business	2
16	Information on labour contracts	2
17.	Basic policies and objectives of management	2
18.	Description of principal plants	2
19.	Details of outstanding stock issues	1
20.	Index of selling prices	1
21.	Index of raw material prices	1
22.	Discussion of new product development	1
23.	Discussion of industry trends	1
24.	Number of employees	1
25.	Description of management	1
26.	List of names of directors	1
27.	Summary of major products produced	1
28.	Information on tax clearances & pending tax claims	1
29.	Advertising expenses for current year	2
30.	Contingent liabilities	2
31.	Inventory breakdown	2
32.	Sources of other earnings	1
33.	Backlogs and projections	1
34.	Number of stockholders	1
	Total number of weights	68

Source: Singhvi, SS and Desai, HB (1971).

APPENDIX G: BUZBY INDEX

	Items of information	*Weight (0-4)*
1.	Information on company directors, such as their names and major outside affiliations	2.93
2.	Information on management, such as their names, ages and functional responsibilities	3.23
3.	Forecast of earnings per share	1.61
4.	Allowance for doubtful accounts	3.09
5.	Breakdown of inventories into raw materials, goods-in-process and finished goods	3.03
6.	Method used to determine the cost of inventories: e.g. LIFO, FIFO, etc; and, the basis for valuing inventories: e.g. lower of cost or market	3.64
7.	Description of major plants and warehouses, including location, function and size	2.09
8.	Description of major products produced, including an indication of those products that are new	3.37
9.	Information about the firm's stock option plan	2.69
10.	Dollar value of the firm's order backlog	3.33
11.	Breakdown of tangible assets into a form such as land, equipment and buildings	3.19
12.	Indication of original cost, accumulated depreciation and the current amount of depreciation charged to income for the tangible assets	3.57
13.	Specification of method used to compute depreciation	3.71
14.	Information about consolidated and unconsoli- dated subsidiaries such as percentage ownership, dividends received, equity in undistributed earnings and summary financial statements	3.71
15.	Pertinent information about investments in firms not qualifying as subsidiaries such as cost and market value of the investment, percentage ownership, dividends received, and equity in undistributed earnings	3.49
16.	Information about the leasing of assets (firm is the lessee)	3.40
17.	Information pertaining to the company's employee pension plan	2.88
18.	Current market value for marketable securities	2.62
19.	Dollar value of the firm's capital expenditures	3.80
20.	Budgeted capital expenditures for the coming year	3.50
21.	Discussion of the major factors which will influence the next year's results to include an indication of the firm's relationship to its industry and the economy	3.23
22.	Measure of the physical level of output such as the percentage of plant capacity utilised	3.11
23.	Number of employees	2.82
24.	Information on the effects of changing price levels, such as pertinent price indices or supplementary price level adjusted statements	2.90
25.	Information about research and development expenditures	3.28
26.	Number of stockholders	2.11
27.	Maintenance and repair expenditures	2.37
28.	Breakdown of sales revenue by major product lines and customer classes	3.67

APPENDIX G (continued)

29.	Breakdown of operating earnings by major product lines and customer classes	3.75
30.	Indication of sales revenue and net income attributable to foreign operations	3.77
31.	Historical summary of important operating data How many years should be covered by the summary? (indicate no. of years)	3.77
32.	Indication of employee morale such as the rate of absenteeism, turnover, etc.	1.58
33.	Information on business combinations such as the accounting method used to record the combination, prices paid, method of payment, accounting treatment of goodwill, etc.	3.40
34.	Schedule of interest and principal due on long-term debt in future years	3.38
35.	Information pertaining to changes in accounting methods	3.87
36.	Statement of sources and uses of funds	3.69
37.	Explanation (reconciliation) of the calculation of primary and fully diluted earning per share	3.58
38.	Information on deferred taxes: e.g. reconciliation of the amount charged to income and the amount actually paid	3.42
39.	Statement of company objectives and dividend policy	2.72

Source: Buzby (1974).

APPENDIX H: BARRETT INDEX

	Item of information	*Subelement*	*Index score Total*
1.	Financial History		
	10 or more years	4.00	
	5 to 9 years	3.00	
	2 to 4 years	2.00	4.00
2.	Segment Reporting: Product Line		
	Sales	2.50	
	Operating Results	1.50	4.00
3.	Segment Reporting: Geographical Area		
	Sales	2.50	
	Operating Results	1.50	4.00
4.	Capital Expenditure: Current		
	No details	3.00	
	At least two categories	4.00	4.00
5.	Capital Expenditure: Planned		
	No details	3.00	
	At least two categories	3.50	3.50
6.	Depreciation Method	N/A	3.50
7.	Funds Flow Statement	N/A	3.50
8.	Retained Earnings Statement (or its generic equivalent)	N/A	3.50
9.	Fixed Asset Composition	N/A	3.00
10.	Inventory Composition	N/A	3.00
11.	Price-Level Adjusted Statements	N/A	3.00
12.	Market Value of Marketable Securities	N/A	2.50
13.	Currency Translation Method	N/A	3.50
14.	Depreciation Life	N/A	3.00
15.	Foreign Exchange Gains and Losses		
	Disclosure of if and how foreign exchangegains and losses are reflected in the income statement	N/A	3.00
16.	Sales and Gross Margin		
	Sales or Gross Margin only	1.50	
	Both	3.00	3.00
17.	Income Tax Disclosure		
	Disclosure of income tax applicable to current period	N/A	2.50
	Total possible index score		56.50

Source: Barrett, E (1976).

APPENDIX I: WISEMAN'S ENVIRONMENTAL DISCLOSURE INDEX

The number of firms reporting, average industry score, and numbers of firms with scores of each of 3, 2 and 1 are set out in Wiseman (1982) for each of the index items detailed below.

Categories and items of information

Economic factors
Past and current expenditures for pollution control equipment and facilities
Past and current operating costs of pollution control equipment and facilities
Future estimates of expenditures for pollution control equipment and facilities
Future estimates of operating costs for pollution control equipment and facilities
Financing for pollution control equipment or facilities

Litigation
Present litigation
Potential litigation

Pollution abatement
Air emission information
Water discharge information
Solid waste disposal information
Control, installations, facilities or processes described
Compliance status of facilities

Other environmentally related information
Discussion of regulations and requirements
Environmental policies or company concern for the environment
Conservation of natural resources
Awards for environmental protection
Recycling
Departments or offices for pollution control

Source: Wiseman (1982).

APPENDIX J: COUNCIL ON ECONOMIC PRIORITIES CHARACTERISTICS

1. Air emissions: for each pollutant, for all point sources, the actual and allowable emission and fugitive emissions for all substances for which occupational health and safety standards have been promulgated....
2. Aggregate water discharges: the net adn gross effluent for each pollutant, the water flow per day, and the receiving bodies: this information is currently required in National Pollution Discharge Elimination System Permit Applications....
3. Processes: the type, capacity, raw materials use by weight and type, and the output of each major process. The raw materials and output data should also be provided in aggregated form for the whole plant.
4. Controls: the type and efficiency of installed controls and process changes, and the dates of new installations planned or under construction....
5. Energy usage: by fuel type, sulphur content, and rate of use (both average daily and peak and low-point power requirements) for each major process and for the whole plant....
6. Solid waste disposal: the type and content of waste; the rate of disposal of each type, and the disposal technique.
7. Legal status: all pending litigation with the sum total of fines and criminal penalties to which the corporation is currently liable, compliance schedules adn administration at local, state and federal levels....
8. Economic factors: the number of employees, the total payroll, and the pollution abatement investment and operating costs anticipated in the current reporting year and for the next five years, excluding those investments and costs associated with changes in the product mix.

Each registrant should also be required to report in aggregate annually:

1. Process capacity and output data.
2. Solid waste, air and water data.
3. Raw material and energy use information.
4. The potential total fine, settlements, and criminal penalties to which the registrant is currently liable.
5. An analysis of the impact of the plans of the corporation to deal with environmental impact. This analysis should assess thsi impact on corporate employment, net earnings, and product prices, in the current year, and in subsequent years, up to the last year for which legislation has been promulgated. The assumptions and method used in the economic analysis should be made available to all interested parties.

Source: Council on Economic Priorities, 1975.

APPENDIX K: DIERKES AND PRESTON CRITERIA

Factor	Impact (Commitment)			Output (Performance)		
	Description	Measure	Further information	Description	Measure	Further information

Energy	Research and development
	Savings measures
	Policy, goals
		D, No, $
		
		D, $
		D, No, ($ or %)
				Consumption
				- total
				- oil
				- gas
				- coal
				- other
				
				Re-use waste heat
					$
					$ per sales
					$ per unit output
					$, % of total consumption	

Air pollution Water pollution Solid waste Noise	Policy and goals Research and development (by pollutant or waste) Control equipment Recycling equipment	D, No D, No $, D % of total investment % increase in production cost		Noise level (nearest house) Air polution by pollutant Water pollution by pollutant Water charges Solid/Semi solid dumped Solid/Semi solid sold New by-products Complaints Lawsuits	dB A W, W/P B.O.D. $ $, W $, W D, S, $ No No, $	Comparison with standards
Despoliation of landscape	Policy and goals Rehabilitation (landscaping) Beautification	D, No D, $ D, $ size area despoiled, size area reclaimed	% production costs	Complaints Lawsuits	No No, $	
Raw materials* Packaging Transport	Policy and goals Research and development: substitution recycling Research and development Modal policy	D, No D, No $ D, No, $ D		Type Waste Use of recycled materials Returnable Waste Energy use Pollution	W, %, $ W, %, $ W, %, $ W, % W, % $, W (as above)	

APPENDIX K (continued)

LEGEND

No.	Absolute quantity. Could mean both staff and beneficiaries.
$	Cost in applicable currency.
%	Proportion or percentage in terms of applicable denominator.
D	Description of policy, measure, goal, activity.
Fr	Frequency of activity
T	Length of time applicable to each activity.
W	Weight
S	Sales
P	Product
A	Assessment

* Consideration may also be given to the use of scarce non-renewable resources, and the use of renewable but long-term resources, e.g., trees.

APPENDIX L: SOME GERMAN POLLUTION REPORTS

Performance of Deutshce Shell AG in Environmental Protection 1975

Activity	Location	Total invest-ment*	Benefit achieved
Air/legal regulation of lead in gasoline			
Prepataion for construction of an isomerisation plant Construction of a pentane separation plant Construction of an isomerisation plant	Godorf Harburg Ingolstad	162	Reduction of lead content in fuels as regulated by the government. The components included in the installations allow high performance of our fuels despite reduction of lead content.
Water protection/ sewerage			
Modernisation of the sluice system	Godorf Ingolstad Grasbrok Monheim	15	Improvement of monitoring capacity of these systems and thereby additional security measures for environmental protection.
Concrete pavement of tank truck unloading areas	Berlin Osnabruck		Protection of the groundwater by tank truck unloading
Enlargement of the capacity of the water purification system	Harburg		Increasing the flexibility and thereby the monitoring capacity of these two systems
Modification and enlargement of overall water purification system	Godorf	23	
Noise protection			
Research and development toward modification of ovens and toward utilisation of quiet ventilators Further employment of quiet motors and compressors	Godorf	3,3	Reduction of noise
Landscape beautification and conservation			
Extension and conservation of the green belt	Godorf Ingolstadt	0,15	Landscape beautification
Environmental protection control			
Air monitoring system Measuring instruments for monitoring air and water emissions	Ingolstadt all refineries	0,2	Control of environmental protection

APPENDIX L (continued)

Corporate Social Performance Report, Industrial Manufacturing Corporation (extract)

Social performance dimension	Company data		Comparison norms		
	Program or coverage	Experience/ utilisation	Industry	Community	Other
Human habitat A. Physical environment 1. Air pollution control	Policy statement (not repro-duced here)	2 plants under EPA stipulations, on two different grounds One division under stipulation with consent order because of inadequate technology Emissions levels Particulates - 37.2 lb/h C + SiO2 + SiC - 93.0 lb/h SO2 - 26.72 lbh Hydrocarbons - 338 lb/h Other - 1040.72 lb/h	None avail-able	Five local EPA test sites 4 failed to meet ambient quality standards Local ambient quality standards not directly comparable with emission data at this time	State and federal EPA goals: Particulates - 30 lb/h C + SiO2 + SiC - 10.06 lb/h SO2 - 2.2 lb/h Hydrocarbons - 15.0 lb/h Other - 54.26 lb/h

Source: Dierkes and Preston (1977)

APPENDIX M: JENSEN'S PHYSICAL ENVIRONMENT IMPACT CRITERIA

The following items were included in Jensen's comprehensive list of potentially interesting items:

INTERNAL MANAGEMENT INTERESTS

G. Effectiveness of the Firm's Role in Society

1. Inventory of employee talents available for social programs, civic volunteer work, etc.
2. Inventory of social programs of the firm and underlying goals, e.g., hiring and training of disadvantaged, pollution abatement, etc.
3. Direct costs/benefits of social programs in the firm.
4. Opportunity costs of engaging in or failing to engage in social programs and various alternative means of carrying out regular activities of the firm.
5. Secondary externalities of main activities.
6. Corporate image and relationships between various corporate activities and that image, as well as the relationships between corporate image and sales, hiring, borrowing, etc.
7. Contributions (money, products, and services from operations, trusts, and foundations) and image of benevolence.

INVESTORS

Major Factors Affecting Long-Run Operations

1. Factors causing changes in the market value of securities, e.g., psychological and sociological implications of pollution-control programs pending or being practiced by a particular firm; the managerial talents existing in a firm merged into a multi-product organisation; the impact of government controls and guidelines imposed on a firm heavily engaged in government contract work; the market implications of government imposed wage and price guidelines; the inflation-deflation psychology of investors themselves.

SOCIETY IN GENERAL

Physical Environment

1. Resources consumed (timber, coal, iron ore, water, oil, etc.) and effects of extraction on the physical environment (strip mining, timber cutting, surface water sheds, soil erosion, etc.).
2. Waste treatment and amounts of various types of water pollutants, thermal pollutants, and sanitary landfills on scenic values, acquatic life, water shed, etc.
3. Amounts of air pollution (e.g., tons of sulphur particulates per unit time) and, if possible, effects both in tersm of health hazards, property values, and discomfort, e.g., effects of emissions on housing patterns, respiratory diseases, plant life, and animal life.
4. Amount of use of pesticides and other chemicals.
5. Scenic disturbances due to plants, warehouse, smoke stacks, rail lines, fences, slag piles, roads, unsightly housing, etc.
6. Increased risks of physical damage, e.g., a coastal port increases the risk of oil spills, a nuclear power plant increases radiation risks, and oil and chemical tanks increase fire and explosion hazards.
7. Indirect effects of operations, e.g., moving a large plant into a community increases air pollution due to increased automobile and airline traffic.

APPENDIX M (continued)

8. Benefits to physical environment, e.g., preserving large tracts of land for timber harvesting may prevent other more destructive types of land and timber usage. Also, companies may help the physical environment in forest fire protection and conservation activities.

Source: Jensen (1976)

APPENDIX N: COMPANIES IN THE SAMPLE, THEIR INDEX SCORES, AND INDUSTRY AVERAGES

		Wiseman index score	Modified Wiseman index score	Cooke index score
	Coal			
1	Amcoal - Anglo American Coal Corporation Ltd.	9	12	6
2	A T Coll - Anglo-Transvaal Collieries Ltd.	0	0	0
3	G.F. Coal - Gold Fields Coal Ltd.	1	1	1
4	Trns Ntl - Trans Natal Coal Corporation Ltd	0	8	3
5	Vierfnt - Vierfontein Colliery Ltd.	2	2	2
6	Wankie - Wankie Colliery Co. Ltd.	1	1	1
7	Wit Cols - Witbank Colliery Ltd.	7	12	6
	Total	20	36	19
	Industry average	2.86	5.14	2.71
	Diamonds			
1	Anamint - Anglo American Investment Trust Ltd.	0	0	0
2	Brdacre - Broadacres Investments Ltd.	0	0	0
3	Carrigs - Carrig Diamonds Ltd.	0	0	0
4	De Beers - De Beers Consolidated Mines Ltd.	5	7	3
5	ICH - Industrial and Commercial Holdings Group Ltd.	0	0	0
6	Trnshex - Trans Hex Group Ltd.	0	0	0
	Total	5	7	3
	Industry average	0.83	1.17	0.50
	Gold - Witwatersrand & Others			
1	Benoni - Benoni Gold Holdings Ltd.	0	0	0
2	Dbn-Dp - Durban Roodepoort Deep Ltd.	0	3	1
3	E R P M - East Rand Proprietary Mines Ltd	0	3	1
4	Ergo - East Rand Gold and Uranium Co Ltd	0	0	0
5	Eerslng - Eersteling Gold Mining Co Ltd	0	0	0
6	E T Cons - Eastern Transvaal Consolidated Mines Ltd	3	3	1
7	Falcon - Falcon Mines Ltd	0	0	0
8	Gazgold - Gazankulu Gold Holdings Ltd	0	0	0
9	Grootvl - Grootvlei Proprietary Mines Ltd	0	6	2
10	Modder - Consolidated Modderfontein Mines Ltd	0	0	0
11	Nigel - Nigel Gold Holdings	0	0	0
12	Osprey - The Osprey Gold Mine Ltd	0	0	0

APPENDIX N (continued)

		Wiseman index score	Modified Wiseman index score	Cooke index score
13	Prim G M - Primrose Gold Mines Ltd	0	0	0
14	Randfnt - The Randfontein Estates Gold Mining Co Witwatersrand Ltd	0	0	0
15	Rd Lease - Rand Leases (Vogelstruisvontein) Gold Mining Co Ltd	0	0	0
16	Sallies - The South African Land & Exploration Co Ltd	0	0	0
17	Simmers - Simmer and Jack Mines Ltd	0	0	0
18	Sth Rdpt - South Roodepoort Main Reef Areas Ltd	0	0	0
19	Sub N - Sub Nigel Gold Mining Co	0	0	0
20	Village - Village Main Reef Gold Mining Co (1934) Ltd	0	3	1
21	Vlaks - Vlakfontein Gold Mining Co Ltd	0	3	1
22	Waverly - Waverley Gold Mines Ltd	0	0	0
23	W Nigel - Witwatersrand Nigel Ltd	0	3	1
24	W R Cons - West Rand Consolidated Mines Ltd	0	3	1
	Gold - Evander			
25	Bracken - Bracken Mines Ltd	0	6	2
26	Kinross - Kinoss Mines Ltd	0	6	2
27	Leslie - Leslie Gold Mines Ltd	0	6	2
28	Winkels - Winkelhaak Mines Ltd	0	6	2
	Gold - Klerksdorp			
29	Aflease - The Afrikander Lease Ltd	0	0	0
30	Buffels - Buffelsfontein Gold Mining Co Ltd	0	6	2
31	Harties - Haartebeesfontein Gold Mining Co Ltd	0	6	2
32	Sovaal - Southvaal Holdings Ltd	0	0	0
33	Stilftn - Stilfontein Gold Mining Co Ltd	0	6	2
34	Vaal Rfs - Vaal Reefs Exploration and Mining Co Ltd	0	0	0
35	Zandpan - Zandpan Gold Mining Co Ltd	0	0	0
	Gold - Orange Free State			
36	Beatrix - Beatrix Mines Ltd	0	0	0

APPENDIX N (continued)

		Wiseman index score	Modified Wiseman index score	Cooke index score
37	Fregold - Free State Consolidated Gold Mines Ltd	1	2	2
38	Harmony - Harmony Gold Mining Co Ltd	0	3	1
39	Loraine - Loraine Gold Mines Ltd	0	0	0
40	Ofsil - Orange Free State Investments Ltd	0	0	0
41	Oryx - Oryx Gold Holdings Ltd	0	0	0
42	St Helena - St Helena Gold Mining Co Ltd	0	2	1
43	Unisel - Unisel Gold Mines Ltd	0	2	1
44	Welkom - Welkom Gold Holdings Ltd	0	0	0
	Gold - West Witwatersrand			
45	Blyvoor - Blyvooruitzicht Gold Mining Co Ltd	2	5	2
46	Deelkrl - Deelkraal Gold Mining Co Ltd	0	0	0
47	Doorns - Doornfontein Gold Mining Co Ltd	0	0	0
48	Dries - Driefontein Consolidated Ltd	0	0	0
49	Elands - Elandsrand Gold Mining Co Ltd	2	3	1
50	Elsburg - Elsburg Gold Mining Co Ltd	0	0	0
51	Kloof - Kloof Gold Mining Co Ltd	0	0	0
52	Libanon - Libanon Gold Mining Co Ltd	0	0	0
53	Venters - Venterspost Gold Mining Co Ltd	0	0	0
54	W Areas - Western Areas Gold Mining Co Ltd	0	0	0
55	Weswits - West Wiwatersrand Gold Holdings Ltd	0	0	0
56	Wstn Dp - Western Deep Levels Ltd	0	0	0
	Gold - Curtailed Operations			
57	Wit G M - Witwatersrand Gold Mining Co Ltd	0	0	0
	Total	8	86	32
	Industry average	0.16	1.53	0.56
	Metals and Minerals - Copper			
1	Botrest - Botswana RST Ltd	0	0	0
2	MCM - Mhangura Copper Mines Ltd	0	0	0
3	Palamin - Palabora Mining Co Ltd	6	8	5
4	Z C I - Zambia Copper Investments Ltd	0	0	0
	Total	6	8	5
	Industry average	1.50	2.00	1.25

APPENDIX N (continued)

		Wiseman index score	Modified Wiseman index score	Cooke index score
	Metals and Minerals - Manganese			
1	Ass Mang - Associated Managanese Mines of SA Ltd	0	0	0
2	Samanco - Samancor Ltd	3	3	3
	Total	3	3	3
	Industry average	1.50	1.50	1.50
	Metals and Minerals - Platinum			
1	Barplat - Barplats Investments Ltd	0	0	0
2	Barmine - Barplats Mines Ltd	0	0	0
3	Implats - Impala Platinum Holdings Ltd	0	2	1
4	Leplat - Lebowa Platinum Mines Ltd	0	0	0
5	Lyd Plat - Lydenburg Platinum Ltd	0	0	0
6	Northam - Northam Paltinum Ltd	0	0	0
7	Rusplat - Rustenburg Platinum Holdings Ltd	0	0	0
	Total	0	2	1
	Industry average	0.00	0.29	0.14
	Metals and Minerals - Tin			
1	Rooibrg - Rooiberg Tin Ltd	0	0	0
2	Uni Tin - Union Tin Mines Ltd	0	9	3
	Total	0	9	3
	Industry average	0.00	4.50	1.50
	Metals and Minerals - Other			
1	Con Mrch - Consolidated Murchison Ltd	3	6	2
2	Gefco - The Griqualand Exploration and Finance Co Ltd	0	12	4
3	Keeley - Keeley Group Holdings Ltd	0	0	0
4	Kudu - Kudu Granite Holdings Ltd	0	0	0
5	Marlin - Marlin Corporation Ltd	0	0	0
6	Mlnhold - Marlin Holdings Ltd	0	0	0
7	Msauli - Msauli Asbes Bpk	2	5	2
8	Vansa - Vansa Vanadium Ltd	0	0	0
	Total	5	23	8
	Industry average	0.63	2.88	1.00

APPENDIX N (continued)

		Wiseman index score	Modified Wiseman index score	Cooke index score
	Mining Financial - Mining Houses			
1	Anglos - Anglo American Corporation of SA Ltd	4	4	3
2	Angvaal - Anglovaal Ltd	1	2	2
3	Avhold - Anglovaal Holdings Ltd	0	0	0
4	Charter - Charter Consolidated Ltd	0	0	0
5	Consmng - Consolidated Mining Corporation Ltd	0	3	1
6	Genbehr - Gencor Beherend Bpk	0	0	0
7	Gencor - Gencor Ltd	6	14	5
8	GFSA - Gold Fields of SA Ltd	0	0	0
9	Johnies - Johannesburg Consolidated Investment Co Ltd	0	0	0
10	Randmin - Rand Mines Ltd	10	12	7
	Total	22	35	17
	Industry average	2.20	3.89	1.67
	Mining Financial - Mining Holding			
1	Amgold - Anglo American Gold Investment Co Ltd	0	0	0
2	Assore - Associated Ore & Metal Corporation Ltd	0	0	0
3	Cor Synd - Coronation Syndicate Ltd	0	0	0
4	Dabi - DAB Investments Ltd	0	0	0
5	Duiker - Duiker Exploration Ltd	0	5	2
6	E Dagga - East Daggafontein Mines	0	0	0
7	Egoli - Egoli Consolidated Mines Ltd	0	3	1
8	Genbel - Genbel Investments Ltd	0	0	0
9	Lonfin - London Finance & Investment Group PLC	0	0	0
10	Mid Wits - Middle Witwatersrand (Western Areas) Ltd	3	3	1
11	Minorco - Minorco Societe Annonyme	5	5	2
12	New Cent - New Central Witwatersrand Areas Ltd	0	0	0
13	New Wits - New Wits Ltd	0	0	0
14	Rand Lon - Rand London Corporation Ltd	1	1	1
15	R M Props - Rand Mines Properties Ltd	0	3	1
16	Southgo - South East Rand Gold Holdings Ltd	0	3	1

APPENDIX N (continued)

		Wiseman index score	Modified Wiseman index score	Cooke index score
17	Tweefnt - Tweefontein United Collieries Ltd	0	0	0
18	Vogels - Vogelstruisbult Metal Holdings Ltd	0	0	0
19	Zaiplat - Zaaiplaats Mining Ltd	0	0	0
	Total	9	23	9
	Industry average	0.47	1.21	0.47
	Industrial - Chemicals and Oil			
1	AECI - AECI Limited	2	2	1
2	Chemserve - Chemical Services Ltd	5	5	2
3	Engen - Engen Ltd	2	4	1
4	Manro - Manro Chemical Holdings Ltd	2	2	1
5	Omnia - Omnia Holdings Ltd	0	0	0
6	Sasol - Sasol Ltd	4	6	2
7	Senchem - Sentrachem Ltd	0	2	0
	Total	15	15	7
	Industry average	2.14	2.14	1.00
	Industrial - Paper and Packaging			
1	Afcom - Afcom Group Ltd	0	0	0
2	Alexwyt - Alex White Holdings Ltd	0	0	0
3	Aries - Aries Packaging Ltd	0	0	0
4	Bowcalf - Bowler Metcalf Ltd	0	0	0
5	Carlcor - Carlton Paper Corporation Ltd	0	0	0
6	Clegg - Clegg Holdings Ltd	0	0	0
7	Coates - Coates Brothers (South Africa) Ltd	0	0	0
8	Compak - Combined Packaging Ltd	0	0	0
9	Consol - Consol Ltd	7	7	4
10	Copi - Canadian Overseas Packaging Industries Ltd	0	0	0
11	CTP - CTP Holdings Ltd	0	0	0
12	Harwill - Harwill Investments Ltd	0	0	0
13	Holdain - Holdains Ltd	4	4	2
14	Hortors - Hortors Ltd	0	0	0
15	Metaclo - Metal Closures Group South Africa Ltd	0	0	0
16	Nampak - Nampak Ltd	2	2	1
17	Plastall - Plastall Ltd	0	0	0
18	Sappi - Sappi Ltd	15	20	8
19	SunPak - Sun Packaging Holdings Ltd	4	4	2

APPENDIX N (continued)

		Wiseman index score	Modified Wiseman index score	Cooke index score
20	Sunvest - Sun Packaging Investments Ltd	4	4	2
21	Trnpaco - Transpaco Ltd	0	0	0
	Total	36	41	19
	Industry average	1.71	1.95	0.90
	Industrial - Steel and Allied			
1	CMI - Consolidated Metallurgical Industries Ltd	0	0	0
2	Hiveld - Highveld Steel & Vanadium Corporation Ltd	0	0	0
3	Iscor - Iscor Ltd	2	4	2
4	Usko - Usko Ltd	0	0	0
	Total	2	4	2
	Industry average	0.50	1.00	0.50
	Transportation			
1	Cargo - Cargo Carriers Ltd	0	0	0
2	Laser - Laser Transport Holdings Ltd	2	2	1
3	Lonrail - Longrail Ltd	0	0	0
4	Mobile - Mobile Industrials Ltd	0	0	0
5	Putco - Putco Ltd	0	0	0
6	Racy - Racy Group Holdings Ltd	0	0	0
7	Suregro - Sure Group Holdings Ltd	1	1	1
8	Trencor - Trencor Ltd	0	0	0
9	Unitran - Unitrans Ltd	0	0	0
	Total	3	3	2
	Industry average	0.33	0.33	0.22
	Electricity			
1	Eskom	12	14	6
	Industry average	12.00	14.00	6.00

APPENDIX O: COMPARISON OF SOUTH AFRICAN AND USA DISCLOSURES

Categories and items of information	SOUTH AFRICA: CHEMICALS AND OIL 90/ 91					UNITED STATES OF AMERICA: OIL, 1974				
	Number of firms reporting	Average industry score	Number of firms with score = 3	Number of firms with score = 2	Number of firms with score = 1	Number of firms reporting	Average industry score	Number of firms with score = 3	Number of firms with score = 2	Number of firms with score = 1
ECONOMIC FACTORS										
Past and current expenditures for pollution control equipment and facilities	0	0.00	0	0	0	7	2.38	6	0	1
Past and current operating costs of pollution control equipment and facilities	0	0.00	0	0	0	1	0.38	1	0	0
Future estimates of expenditures for pollution control equipment and facilities	1	0.43	1	0	0	1	0.38	1	0	0
Future estimates of operating costs for pollution control equipment and facilities	0	0.00	0	0	0	0	0.00	0	0	0
Financing for pollution control equipment or facilities	0	0.00	0	0	0	0	0.00	0	0	0
LITIGATION										
Present litigation	0	0.00	0	0	0	0	0.00	0	0	0
Potential litigation	0	0.00	0	0	0	0	0.00	0	0	0
POLLUTION ABATEMENT										
Air emission information	0	0.00	0	0	0	8	1.25	0	2	6
Water discharge information	0	0.00	0	0	0	6	1.00	0	2	4
Solid waste disposal information	0	0.00	0	0	0	1	0.13	0	0	1
Control, installations, facilities or processes described	0	0.00	0	0	0	7	1.75	0	7	0
Compliance status of facilities	0	0.00	0	0	0	1	0.25	0	1	0
OTHER ENVIRONMENTALLY RELATED INFORMATION										
Discussion of regulations and requirements	0	0.00	0	0	0	4	0.63	0	1	3
Environmental policies or company concern for the environment	4	1.00	0	3	1	4	0.50	0	0	4
Conservation of natural resources	2	0.71	1	1	0	3	0.50	0	1	2
Awards for environmental protection	0	0.00	0	0	0	1	0.13	0	1	0
Recycling	0	0.00	0	0	0	0	0.00	0	0	0
Departments or offices for pollution control	0	0.00	0	0	0	0	0.00	0	0	0
Total average industry score		2.14					9.28			
Number of firms in sample	7					8				

APPENDIX O: COMPARISON OF SOUTH AFRICAN AND USA DISCLOSURES (continued)

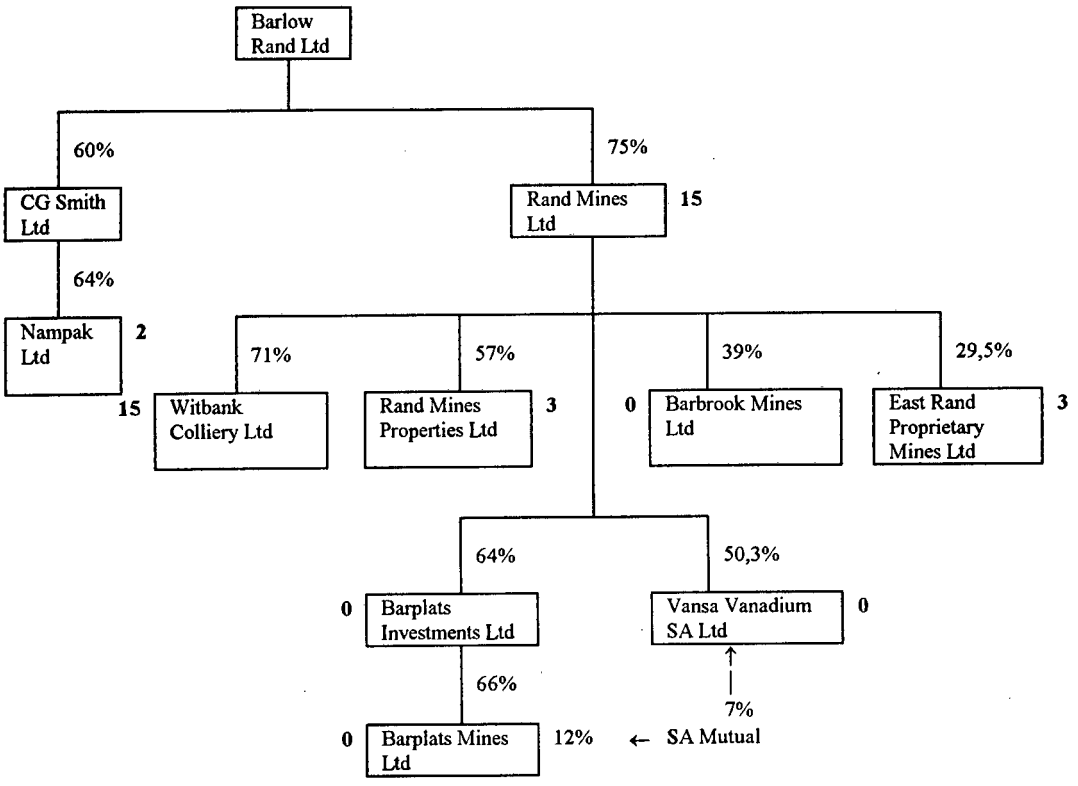
Categories and items of information	SOUTH AFRICA: STEEL AND ALLIED, 1990/91					UNITED STATES OF AMERICA: STEEL, 1974				
	Number of firms reporting	Average industry score	Number of firms with score = 3	Number of firms with score = 2	Number of firms with score = 1	Number of firms reporting	Average industry score	Number of firms with score = 3	Number of firms with score = 2	Number of firms with score = 1
ECONOMIC FACTORS										
Past and current expenditures for pollution control equipment and facilities	0	0.00	0	0	0	6	2.29	5	0	1
Past and current operating costs of pollution control equipment and facilities	0	0.00	0	0	0	4	1.57	3	1	0
Future estimates of expenditures for pollution control equipment and facilities	0	0.00	0	0	0	5	1.86	4	0	1
Future estimates of operating costs for pollution control equipment and facilities	0	0.00	0	0	0	2	0.43	0	1	1
Financing for pollution control equipment or facilities	0	0.00	0	0	0	3	1.29	3	0	0
LITIGATION										
Present litigation	0	0.00	0	0	0	4	1.29	2	1	1
Potential litigation	0	0.00	0	0	0	0	0.00	0	0	0
POLLUTION ABATEMENT										
Air emission information	0	0.00	0	0	0	6	1.57	2	1	1
Water discharge information	0	0.00	0	0	0	5	1.29	1	4	0
Solid waste disposal information	0	0.00	0	0	0	3	1.00	0	0	1
Control, installations, facilities or processes described	0	0.00	0	0	0	7	2.29	1	2	0
Compliance status of facilities	0	0.00	0	0	0	6	1.29	0	3	3
OTHER ENVIRONMENTALLY RELATED INFORMATION										
Discussion of regulations and requirements	0	0.00	0	0	0	6	1.29	1	1	4
Environmental policies or company concern for the environment	1	0.50	0	1	0	4	0.71	0	1	3
Conservation of natural resources	0	0.00	0	0	0	0	0.00	0	0	0
Awards for environmental protection	0	0.00	0	0	0	0	0.00	0	0	0
Recycling	0	0.00	0	0	0	0	0.00	0	0	0
Departments or offices for pollution control	0	0.00	0	0	0	1	0.29	0	1	0
Total average industry score		0.50					18.46			
Number of firms in sample	3					7				

APPENDIX O: COMPARISON OF SOUTH AFRICAN AND USA DISCLOSURES (continued)

Categories and items of information	SOUTH AFRICA: PAPER AND PACKAGING 1990/91					UNITED STATES OF AMERICA: PAPER AND PULP 1972				
	Number of firms reporting	Average industry score	Number of firms with score = 3	Number of firms with score = 2	Number of firms with score = 1	Number of firms reporting	Average industry score	Number of firms with score = 3	Number of firms with score = 2	Number of firms with score = 1
ECONOMIC FACTORS										
Past and current expenditures for pollution control equipment and facilities	1	0.14	1	0	0	10	2.36	8	0	2
Past and current operating costs of pollution control equipment and facilities	0	0.00	0	0	0	2	0.55	2	0	0
Future estimates of expenditures for pollution control equipment and facilities	1	0.10	0	1	0	7	1.73	6	0	1
Future estimates of operating costs for pollution control equipment and facilities	0	0.00	0	0	0	1	0.09	0	0	1
Financing for pollution control equipment or facilities	0	0.00	0	0	0	4	0.91	3	0	1
LITIGATION										
Present litigation	0	0.00	0	0	0	2	0.27	0	1	1
Potential litigation	0	0.00	0	0	0	0	0.00	0	0	0
POLLUTION ABATEMENT										
Air emission information	1	0.05	0	0	1	10	1.55	1	5	4
Water discharge information	1	0.14	0	0	3	10	1.82	4	2	4
Solid waste disposal information	0	0.00	0	0	0	8	1.00	0	3	5
Control, installations, facilities or processes described	0	0.00	0	0	0	9	1.55	2	4	3
Compliance status of facilities	0	0.00	0	0	0	6	1.00	2	1	3
OTHER ENVIRONMENTALLY RELATED INFORMATION										
Discussion of regulations and requirements	1	0.05	0	0	1	6	0.73	0	2	4
Environmental policies or company concern for the environment	3	0.38	0	4	0	10	1.27	0	4	6
Conservation of natural resources	1	0.14	1	0	0	9	1.73	2	6	1
Awards for environmental protection	0	0.00	0	0	0	3	0.55	0	3	0
Recycling	5	0.71	1	6	0	6	1.27	3	2	1
Departments or offices for pollution control	0	0.00	0	0	0	2	0.27	0	1	1
Total average industry score		1.71					18.65			
Number of firms in sample	21					11				

APPENDIX P: LARGE GROUPS AND DISCLOSURE SCORES

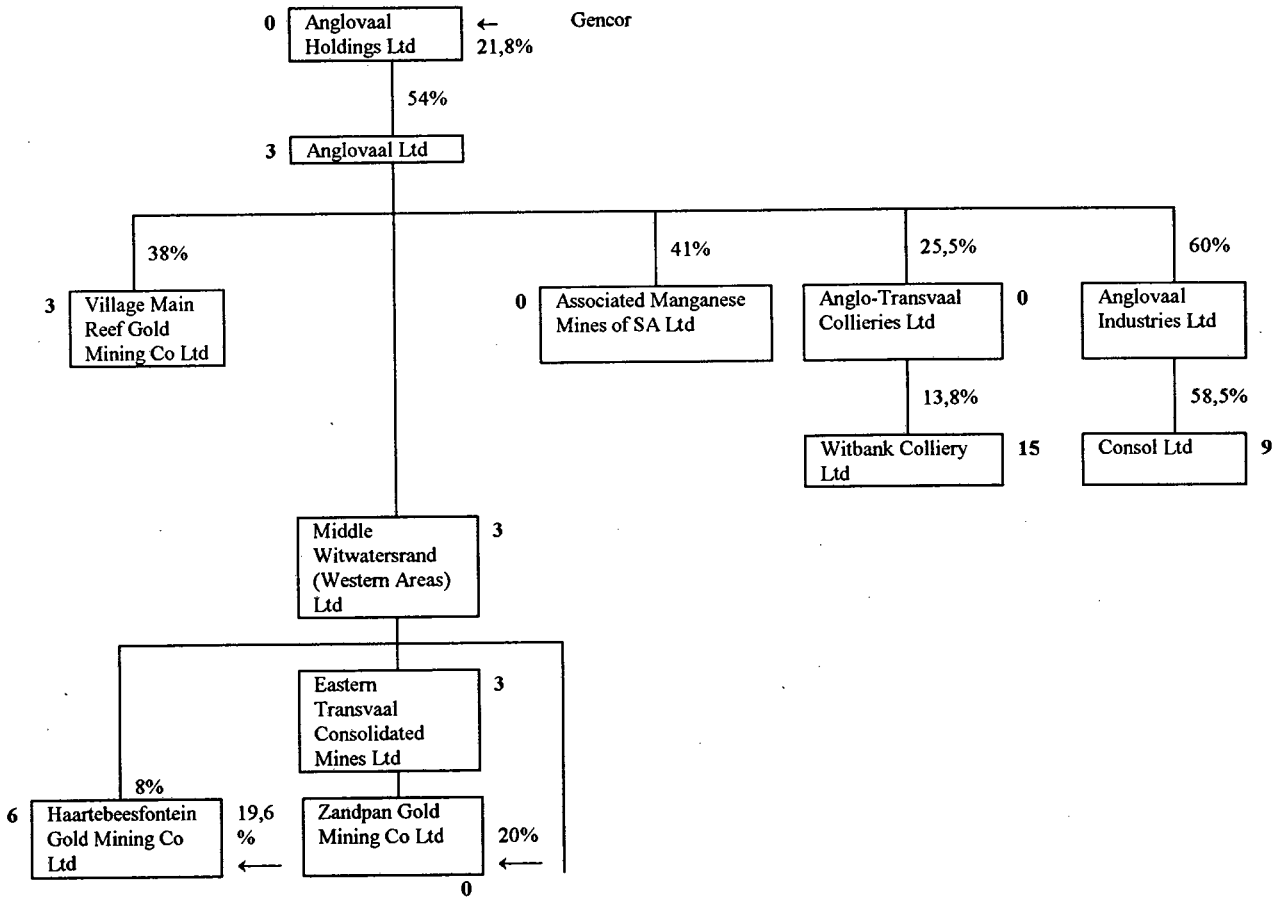
Barlow Rand Group



Index scores are in bold type.

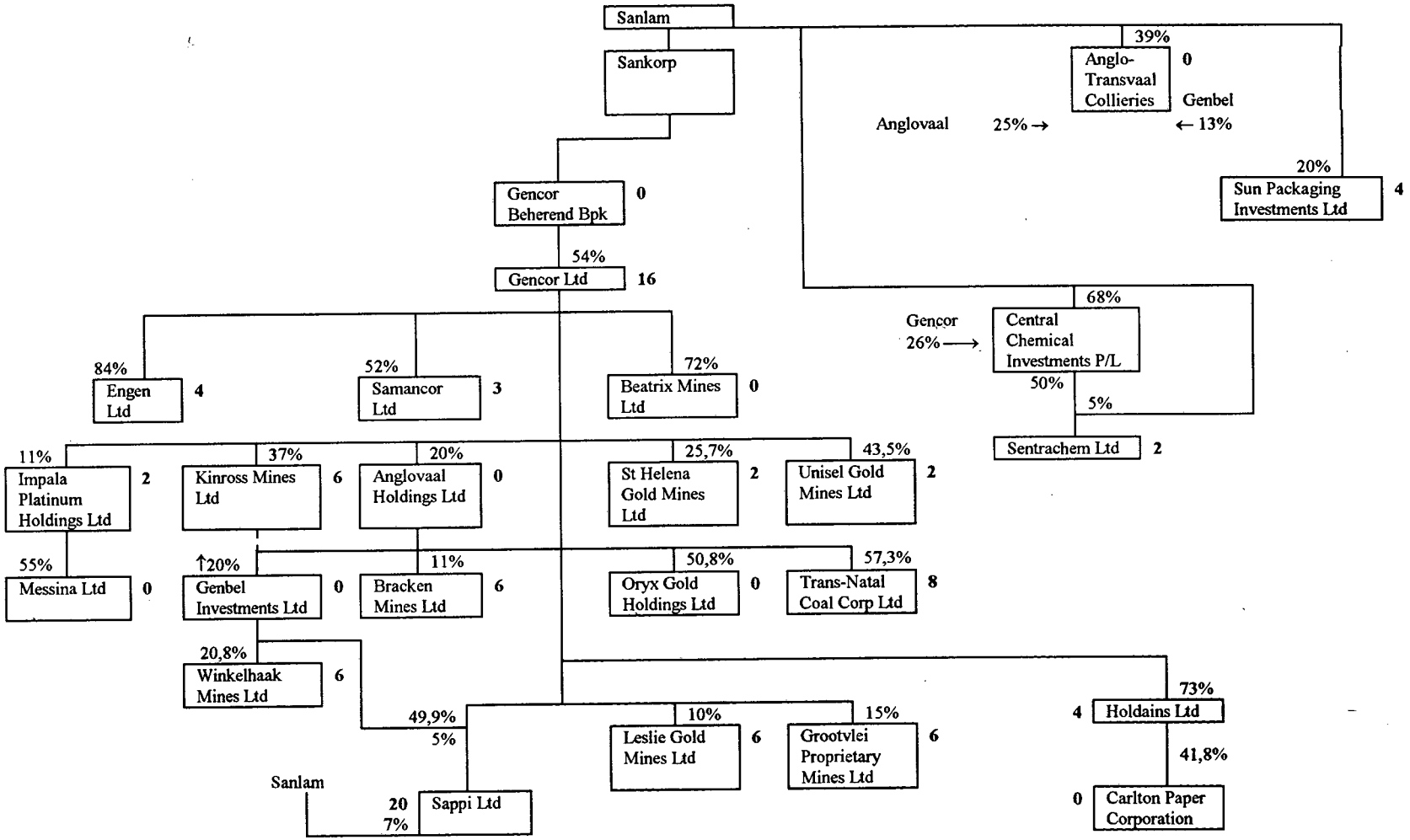
APPENDIX P (continued)

Anglovaal Holdings group



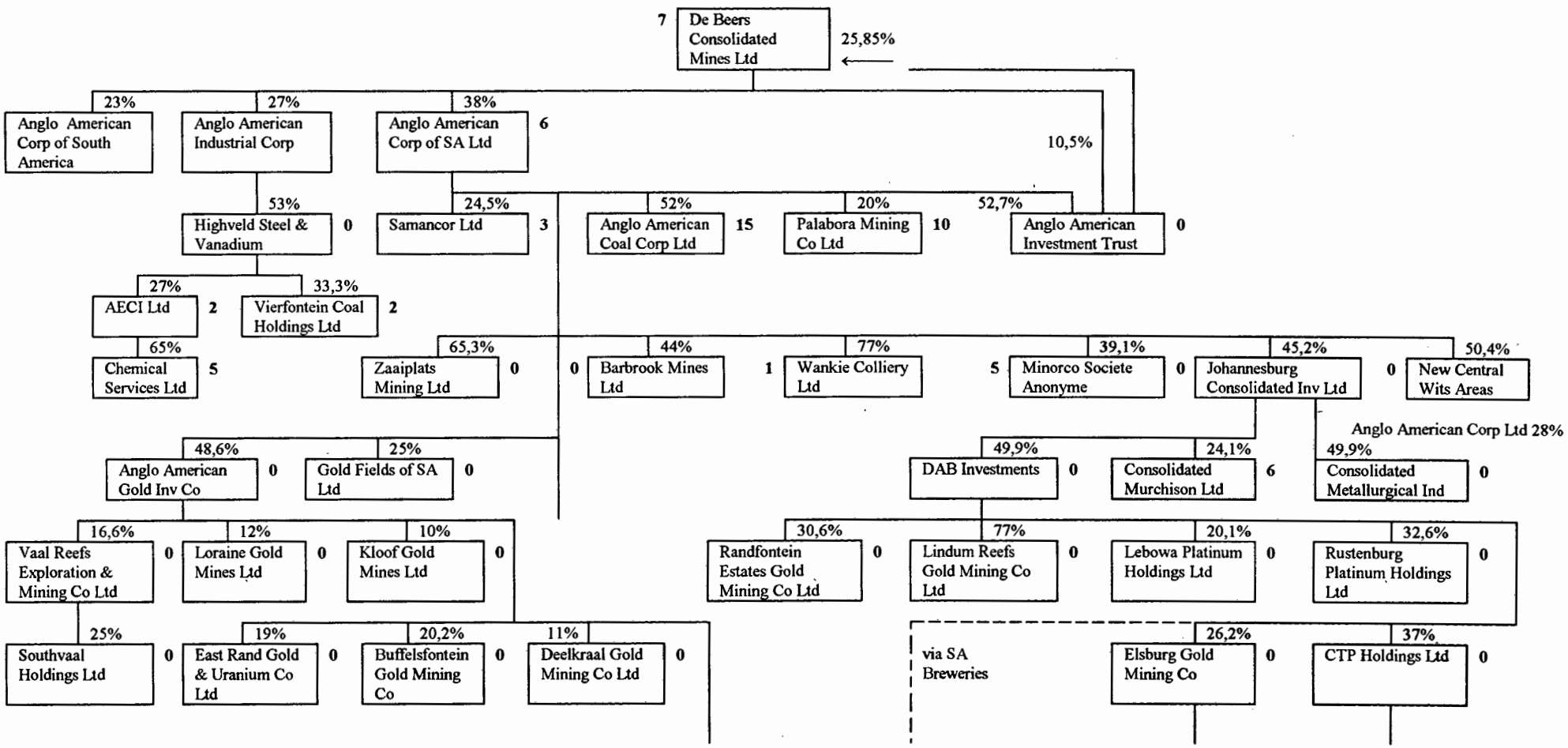
APPENDIX P (continued)

Gencor group

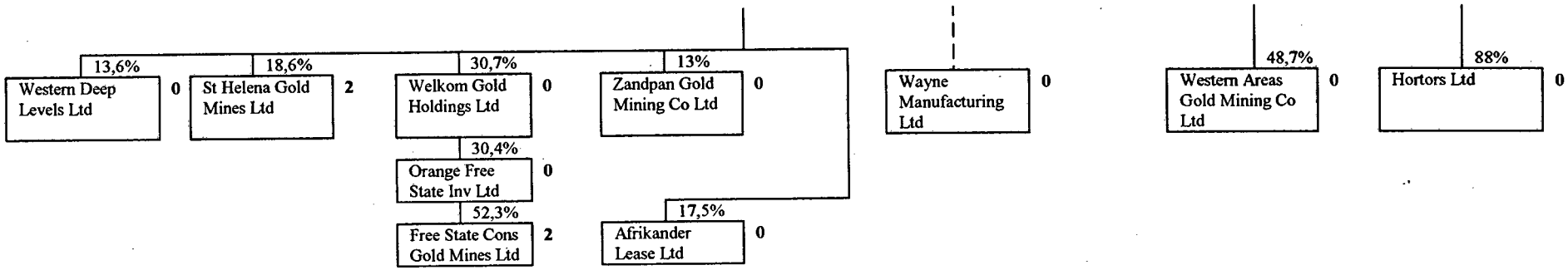


APPENDIX P (continued)

De Beers Consolidated Mines group

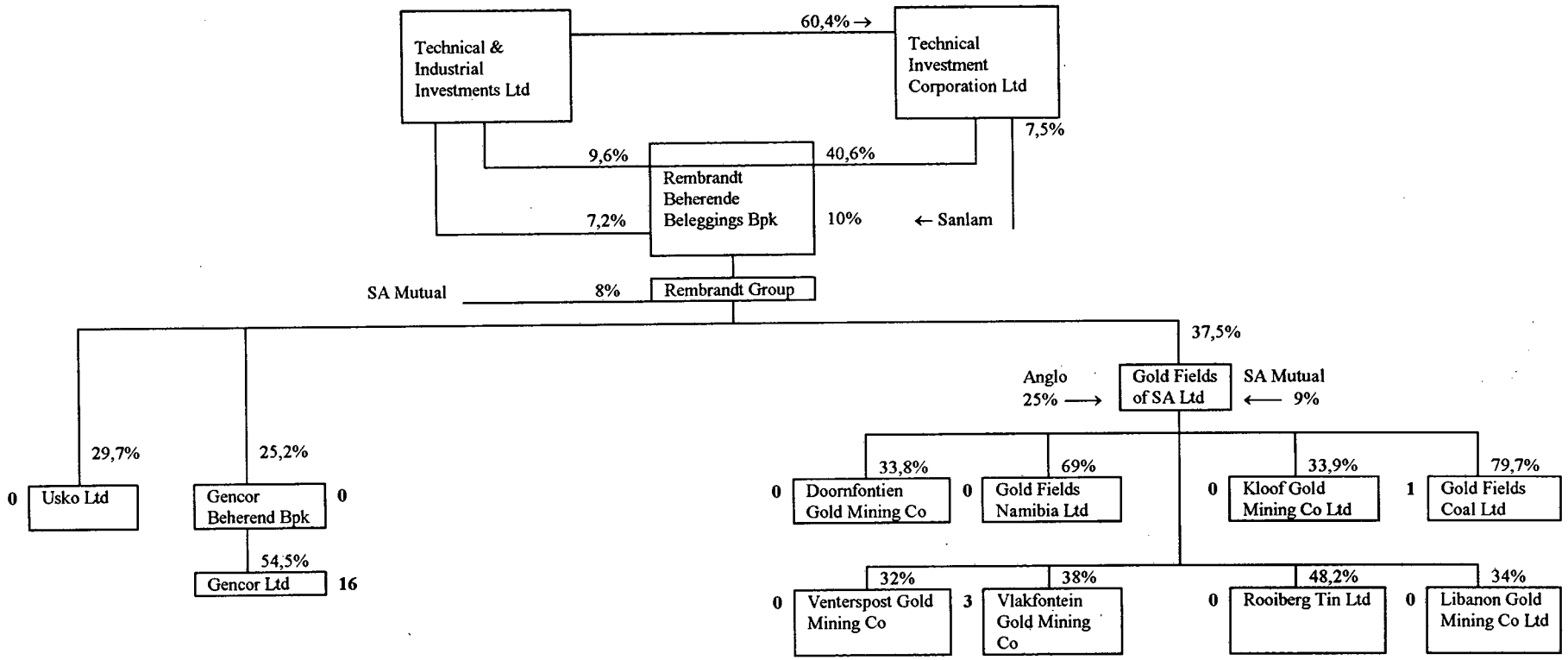


De Beers Consolidated Mines group (continued)



APPENDIX P (continued)

Rembrandt group



APPENDIX Q: NUMBER OF COMPANIES REPORTING EACH INDEX ITEM PER SECTOR

INDEX CATEGORY	Coal	Dia-monds	Gold	Copper	Manga-nese	Plati-num	Tin	Other metals	Mining houses	Mining holdings	Chemi-cals&oil	Paper	Steel	Trans-port	Elec-tricity	TOTAL
ECONOMIC FACTORS																
Past and current capex	1								1			1				3
Past and current operating costs																0
Estimated future capex			1		1				1	1	1	1				6
Estimated future operating costs																0
Financing																0
POLLUTION ABATEMENT																
Air emission information												1				1
Waste discharge information												1				1
Solid waste disposal information																0
Description of controls				1												1
Compliance status															1	1
OTHER INFORMATION																
Regulations and requirements	3		1	1						1		1				7
Environmental policies/ concern	2	1	2	1	1				2	1	4	3	1	1	1	20
Conservation	5	1		1				2	2	1	2	1			1	16
Protection awards															1	1
Recycling			2									5				7
Pollution control dept./ offices	2								1						1	4
FINANCIAL INFORMATION																
Accounting policy	1					1				1						3
Balance sheet provision	2		15				1	3	2	3						26
Movements on provision	1		1				1	2								5
Amounts in cash flow	1						1	1								3
Contingent liabilities			1						2	1						4
Income statement																0
Environmental impact studies	1								1	1						3
Support for campains	1	1		1					1			2			1	7

APPENDIX R: INDEX SCORES PER SUBCATEGORY

		ECONOMIC FACTORS		POLLUTION ABATEMENT		OTHER ENVIRONMENTAL INFORMATION		FINANCIAL DISCLOSURES	
INDUSTRY	INDEX	1990/91	1986/87	1990/91	1986/87	1990/91	1986/87	1990/91	1986/87
Coal	Wiseman	0.29	-	-	-	2.57	-		
	Modified Wiseman	0.29	-	-	-	2.57	-	2.30	0.43
	Cooke	0.14	-	-	-	1.72	-	0.85	0.17
Diamonds	Wiseman	-	-	-	-	0.50	-		
	Modified Wiseman	-	-	-	-	0.83	-	0.33	-
	Cooke	-	-	-	-	0.34	-	0.17	-
Gold	Wiseman	0.05	-	-	-	0.05	-		
	Modified Wiseman	0.05	-	-	-	0.05	-	1.38	0.21
	Cooke	0.02	-	-	-	0.10	-	0.44	0.01
Copper	Wiseman	-	-	0.25	-	1.25	-		
	Modified Wiseman	-	-	0.25	-	1.25	-	0.50	-
	Cooke	-	-	0.25	-	0.75	-	0.25	-
Manganese	Wiseman	1.00	-	-	-	0.50	-		
	Modified Wiseman	1.00	-	-	-	0.50	-	-	-
	Cooke	0.50	-	-	-	1.00	-	-	-
Platinum	Wiseman	-	-	-	-	-	-		
	Modified Wiseman	-	-	-	-	-	-	0.29	-
	Cooke	-	-	-	-	-	-	0.14	-
Tin	Wiseman	-	-	-	-	-	-		
	Modified Wiseman	-	-	-	-	-	-	4.50	-
	Cooke	-	-	-	-	-	-	1.50	-
Other metals	Wiseman	-	0.38	-	0.13	0.63	-		
	Modified Wiseman	-	0.38	-	0.13	0.63	-	2.25	0.88
	Cooke	-	0.07	-	0.03	0.25	-	0.75	0.05
Mining houses	Wiseman	0.66	-	-	-	1.32	0.11		
	Modified Wiseman	0.66	-	-	-	1.32	0.11	0.78	-
	Cooke	0.22	-	-	-	0.66	0.11	0.66	-
Mining holding	Wiseman	0.16	-	-	0.11	0.31	-		
	Modified Wiseman	0.16	-	-	0.11	0.31	-	0.74	0.26
	Cooke	0.05	-	-	0.05	0.15	-	0.26	0.01
Chemicals & oil	Wiseman	0.43	-	-	-	1.71	0.14		
	Modified Wiseman	0.43	-	-	-	1.71	0.14	-	-
	Cooke	0.14	-	-	-	0.86	0.14	-	-
Paper and packaging	Wiseman	0.30	0.12	0.24	-	1.42	0.24		
	Modified Wiseman	0.30	0.12	0.24	-	1.42	0.24	0.29	0.06
	Cooke	0.12	0.03	0.12	-	0.77	0.18	0.12	0.01
Steel and allied	Wiseman	-	-	-	-	0.50	-		
	Modified Wiseman	-	-	-	-	0.50	-	0.50	-
	Cooke	-	-	-	-	0.25	-	0.25	-
Transportation	Wiseman	-	-	-	-	0.25	-		
	Modified Wiseman	-	-	-	-	0.25	-	-	-
	Cooke	-	-	-	-	0.02	-	-	-
Electricity	Wiseman	-	-	3.00	-	9.00	-		
	Modified Wiseman	-	-	3.00	-	9.00	-	2.00	-
	Cooke	-	-	1.00	-	4.00	-	1.00	-

APPENDIX S: ESKOM'S ENVIRONMENTAL AUDIT REPORT

STATEMENT BY THE ENVIRONMENTAL AUDITING TEAM

We have conducted an investigation with two primary objectives:

- to evaluate the existence and appropriateness of Eskom's environmental goals, policies and standards
- to give an opinion on the quality of environmental management systems in place in Eskom's distribution and transmission business units, and in its operational coal-fired power stations

For the purpose of this statement, "environment" refers to the natural environment.
Our findings and conclusions are as follows:

Environmental vision

By world standards, Eskom is up to date with - and in some cases at the cutting edge of - environmental policy, and within South Africa the organisation is taking a leading role in corporate environmental management. At top management level, there is clear vision and leadership regarding the environmental goal which needs to be achieved, namely to have a positive net impact on the biophysical environment. This is an extremely challenging goal, especially in the light of the very nature of Eskom's business, its existing technology and economic restraints.

Top level committment

Top management committment to the above goal is evidenced by the organisation accepting responsibility for an installation's entire life cycle; acknowledgement of line responsibilityfor environmental impacts; the inclusion of environmental auditing as an integral element of environmental management; the establishment of a separate Environmental Impact Management department and the acceptance by senior executives of accountability for environmental performance.

Progress to date

Overall, Eskom has achieved a great deal in a short space of time in terms of establishing the infrastructure for an environmental management system throughout the organisation. The comprehensive internal audit of environmental management systems during 1990 played a major role in raising general environmental awareness and upgrading management systems at the operational level. Several specific conservation projects have been initiated and supported by Eskom, especially through Eskom's Wildlife Impact Advisory Committee.

Stage of development

Given that integrated environmental management is a relatively recent management practice worldwide, the primary focus within Eskom at an operational level is still on addressing issues of high public awareness and the minimisation of obvious impacts. This differs significantly from the corporate goal of having a net positive impact on the environment.

APPENDIX S (continued)

Formalisation of systems

Many environmental management systems have not yet been formalised at the operational level (e.g.: in terms of policies, procedures, structures and plans). This lack of formalisation leads to an ad hoc approach which is very often reactive and dependent on the level of awareness and committment of the individual. There is also considerable scope for the integration of environmental management within Eskom, withnin business units, between business units and between the business units and corporate level.

Air quality issues

By virtue of the variation in the quality of coal, specifically ash and sulphur content, and the resultant influence on the operating efficiency of the dust-removing equipment, many of Eskom's power stations are unable to consistently comply with legal requirements regarding emissions. Although in most cases measuring equipment exists, older power stations are unable to measure air emissions accurately. While studies are regularly conducted to apportion impact on air quality and crops, Eskom is unable to quantify conclusively the impact it is having on the environment through air pollution.

Skills, knowledge and training

At this stage, although good environmental intentions exist, generally there is insufficient understanding in Eskom of the extent of the organisation's actual and potential impacts on the environment and os ways of managing these issues. Training has been identified as a top priority requirement, both at a broad sensitisation level and at a specific, technical level.

The need for an environmental management process

As many environmental decisions are being made on a subjective basis within Eskom at present, there is a need for a comprehensive environmental management process. Such a process would incorporate a sound decision support system to help managers make responsible trade-off decisions which take environmental considerations into account.

Conclusions

Relative to its position a few years ago in terms of environmental management systems, Eskom has made enourmous progress. Relative to what should be in place to ensure good environmental management systems throughout the organisation, much has still to be achieved. In terms of international trends, the organisation is headed in the right direction, with support and committment from senior management. Through achieving all of the objectives to which management has already committed itself, the required environmental management systems will be in place.

Deloitte Pim Goldby
Management consultants

No.	Company	Year end		Total score	Total assets (R000s)	International shareholders 1=internat. 0=no internat.
1	Amcoal	31 March	1991	12	2506613	0
2	A.T. Coll.	30 September	1990	0	3575	0
3	G.F. Coal	31 December	1990	1	223118	0
4	Trans Ntl	30 June	1990	8	1337300	0
5	Vierfnt.	31 March	1991	2	2523	0
6	Wankie	28 February	1991	1	274436	0
7	Wit Cols	30 September	1990	12	1594541	0
8	Anamint	31 March	1991	0	3827000	0
9	Brdacre	30 June	1991	0	4096	1
10	Carrigs	31 March	1991	0	14328	0
11	De Beers	31 December	1990	7	11432000	0
12	ICH	30 June	1991	0	66715	0
13	Trnshex	31 March	1991	0	901252	0
14	Benoni	31 March	1991	0	71169	0
15	Dbn-DP	31 Dec	1990	3	199091	0
16	ERPM	31 Dec	1990	3	667207	1
17	Ergo	31 March	1991	0	737509	0
18	Eerslng	30 June	1990	0	60182	0
19	ET Cons	30 June	1991	3	240682	0
20	Falcon	31 March	1991	0	109100	0
21	Gazgold	31 March	1991	0	56842	0
22	Grootvl	31 December	1990	6	83863	0
23	Modder	30 June	1990	0	206463	0
24	Nigel	31 March	1991	0	39592	0
25	Osprey	30 June	1990	0	18857	1
26	Prim G M	30 June	1991	0	27299	0
27	Randfnt	30 June	1991	0	2247304	0
28	Rd Lease	30 June	1990	0	48323	0
29	Sallies	31 December	1990	0	265902	0
30	Simmers	30 June	1991	0	113377	0
31	Sth Rdpt	30 June	1990	0	88177	0
32	Sub N	30 June	1991	0	29469	0
33	Village	30 June	1991	3	24284	0
34	Vlaks	30 June	1991	3	8353	0
35	Waverly	31 March	1990	0	12922	0
36	W Nigel	31 March	1991	3	39737	0
37	W R Cons	31 December	1990	3	70673	0
38	Bracken	30 September	1990	6	55455	0
39	Kinross	30 September	1990	6	346342	0
40	Leslie	30 Sept	1990	6	65217	0
41	Winkels	30 Sept	1990	6	560575	0
42	Af Lease	31 December	1990	0	889	0
43	Buffels	30 June	1991	6	1415627	0
44	Harties	30 June	1991	6	1001859	0
45	Sovaal	31 December	1990	0	44787	0
46	Stilftn	31 December	1990	6	290005	0
47	Vaal Rfs	31 December	1990	0	3240400	0
48	Zandpan	30 June	1991	0	33152	0
49	Beatrix	31 August	1990	0	178000	0

No.	Company	Year end		Total score	Total assets (R000s)	International shareholders 1=internat. 0=no internat.
50	Fregold	31 March	1991	2	5853000	0
51	Harmony	30 June	1990	3	1051666	0
52	Loraine	30 September	1991	0	313764	0
53	Ofsil	31 March	1991	0	140600	0
54	Oryx	31 August	1990	0	945013	0
55	St Helena	31 December	1990	2	1193122	0
56	Unisel	30 September	1990	2	198994	0
57	Welkom	31 March	1991	0	226508	0
58	Blyvoor	30 June	1991	5	384487	0
59	Deelkrl	30 June	1991	0	611669	0
60	Doorns	30 June	1991	0	492358	0
61	Dries	30 June	1991	0	2742758	0
62	Elands	31 December	1991	3	1058675	0
63	Elsburg	30 June	1991	0	145165	0
64	Kloof	30 June	1991	0	2295456	0
65	Libanon	30 June	1991	0	398161	0
66	Venters	30 June	1991	0	321283	0
67	W. Areas	30 June	1991	0	836697	0
68	Weswits	31 March	1990	0	104957	0
69	Wstn Dp	31 December	1990	0	2813100	0
70	Wit GM	30 June	1991	0	6229	0
71	Botrest	31 December	1990	0	479992	1
72	MCM	30 June	1991	0	122459	
73	Palamin	31 December	1990	8	1066856	0
74	Z.C.I.	30 June	1991	0	133871	1
75	Ass mang	31 December	1990	0	544055	0
76	Samanco	30 June	1991	3	1897962	0
77	Barplat	30 September	1990	0	1116772	0
78	Barmine	30 Spetember	1990	0	1146286	0
79	Implats	30 June	1991	2	3281200	0
80	Leplat	30 June	1991	0	291791	0
81	Lyd Plat	30 September	1990	0	751786	0
82	Northam	30 June	1991	0	1262998	0
83	Rusplat		1991	0	2810200	0
84	Rooibrg	31 December	1990	0	61277	0
85	Uni Tin	31 December	1990	9	18638	0
86	Con Mrch	30 June	1990	6	96955	0
87	Gefco	31 December	1990	12	220861	0
88	Keeley	28 February	1990	0	142711	0
89	Kudu	30 June	1990	0	56721	0
90	Marlin	30 June	1991	0	238621	0
91	Mlnhold	30 June	1991	0	285627	0
92	Msauli	31 December	1990	5	75692	0
93	Vansa	30 September	1991	0	76829	0
94	Anglos	31 March	1991	4	20839000	0
95	Angvaal	30 June	1991	2	6098000	0
96	Avhold	30 June	1991	0	17726	0
97	Charter (UK)	31 March	1991	0	2165440	1
98	Consmhg	31 March	1990	3	314297	0

No.	Company	Year end		Total score	Total assets (R000s)	International shareholders 1=internat. 0=no internat.
99	Genbehr			0	4245000	0
100	Gencor	31 August	1990	14	8391000	0
101	GFSA	30 June	1991	0	3092000	0
102	Johnies	30 June	1991	0	4596000	0
103	Randmin	30 September	1990	12	3721400	0
104	Amgold	31 March	1991	0	1044000	0
105	Assore	30 June	1991	0	573592	0
106	Cor Synd	30 September	1990	0	3452	0
107	Dabi	30 June	1991	0	13056	0
108	Duiker	30 September	1990	5	237821	0
109	E Dagga	31 March	1991	0	91741	1
110	Egoli	31 March	1990	3	264639	0
111	Genbel	30 June	1991	0	1396000	0
112	Lonfin (UK)	31 December	1990	0	29424	0
113	Mid Wits	30 June	1991	3	699826	0
114	Minorco (US$)	30 June	1991	5	11613000	1
115	New Cent	30 September	1990	0	3965	0
116	New Wits	30 June	1991	0	183419	0
117	Rand Lon	31 March	1989	1	76200	0
118	R M Props	30 September	1990	3	244306	0
119	Southgo	31 December	1990	3	265902	0
120	Tweefnt	30 September	1990	0	8170	0
121	Vogels	31 December	1990	0	59421	0
122	Zaiplat	31 March	1990	0	17378	1
123	AECI	31 December	1990	2	3235000	0
124	Chemserve	31 December	1990	5	226486	0
125	Engen	31 August	1991	4	3785635	0
126	Manro	30 June	1990	2	57998	0
127	Omnia	31 December	1990	0	277151	0
128	Sasol	25 June	1991	6	10678521	0
129	Senchem	31 August	1991	2	1271550	0
130	Afcom	30 June	1991	0	57242	0
131	Alexwyt		1991	0	41349	0
132	Aries		1990	0	13662	0
133	Bowcalf		1990	0	11571	0
134	Carlcor	31 August	1991	0	231609	0
135	Clegg		1991	0	17253	0
136	Coates	31 December	1990	0	70120	1
137	Compak		1991	0	101082	0
138	Consol	30 June	1991	7	1109599	0
139	Copi	30 June	1991	0	234865	1
140	CTP	31 March	1990	0	234888	0
141	Harwill	30 June	1991	0	15021	0
142	Holdain	31 August	1990	4	834104	0
143	Hortors	31 March	1990	0	48565	0
144	Metaclo	31 December	1990	0	81148	1
145	Nampak	30 September	1990	2	2024000	0
146	Plastall	30 September	1991	0	30044	0
147	Sappi	28 February	1991	20	5711600	0

No.	Company	Year end		Total score	Total assets (R000s)	International shareholders 1=internat. 0=no internat.
148	SunPak	31 August	1990	4	70193	0
149	Sunvest		1990	4	73180	0
150	Trnpaco		1990	0	23353	0
151	CMI	30 June	1991	0	436392	0
152	Hiveld	31 December	1990	0	1546024	0
153	Iscor		1991	4	9697300	0
154	Usko	30 September	1990	0	384607	0
155	Cargo	28 February	1991	0	119334	0
156	Laser	31 December	1990	2	61271	0
157	Lonrail	28 February	1991	0	36208	0
158	Mobile	30 June	1991	0	219875	0
159	Putco	30 June	1991	0	195612	0
160	Racy	31 March	1991	0	41836	0
161	Suregro		1989	1	40579	0
162	Trencor	30 June	1991	0	597862	0
163	Unitran	31 March	1991	0	255006	0
164	Eskom	31 December	1990	14	38717000	0
TOTALS				**315**	**226420874**	**12**
			Mean =	1.92		

No.	Total assets squared	Total assets x total score	Prediction of index score using a and b calculated below	Total variance = (total score less mean of predictions)^2	Unexplained variance = (total score - prediction)^2	(Total score less mean of total score)^2
1	6283108731769	30079356	2.33	102	93	102
2	12780625	0	1.42	4	2	4
3	49781641924	223118	1.50	1	0	1
4	1788371290000	10698400	1.90	37	37	37
5	6365529	5046	1.42	0	0	0
6	75315118096	274436	1.52	1	0	1
7	2542561000681	19134492	2.00	102	100	102
8	14645929000000	0	2.81	4	8	4
9	16777216	0	1.42	4	2	4
10	205291584	0	1.42	4	2	4
11	130690624000000	80024000	5.58	26	2	26
12	4450891225	0	1.44	4	2	4
13	812255167504	0	1.75	4	3	4
14	5065026561	0	1.44	4	2	4
15	39637226281	597273	1.49	1	2	1
16	445165180849	2001621	1.66	1	2	1
17	543919525081	0	1.69	4	3	4
18	3621873124	0	1.44	4	2	4
19	57927825124	722046	1.51	1	2	1
20	11902810000	0	1.46	4	2	4
21	3231012964	0	1.44	4	2	4
22	7033002769	503178	1.45	17	21	17
23	42626970369	0	1.49	4	2	4
24	1567526464	0	1.43	4	2	4
25	355586449	0	1.43	4	2	4
26	745235401	0	1.43	4	2	4
27	5050375268416	0	2.24	4	5	4
28	2335112329	0	1.44	4	2	4
29	70703873604	0	1.52	4	2	4
30	12854344129	0	1.46	4	2	4
31	7775183329	0	1.45	4	2	4
32	868421961	0	1.43	4	2	4
33	589712656	72852	1.43	1	2	1
34	69772609	25059	1.42	1	2	1
35	166978084	0	1.42	4	2	4
36	1579029169	119211	1.43	1	2	1
37	4994672929	212019	1.44	1	2	1
38	3075257025	332730	1.44	17	21	17
39	119952780964	2078052	1.54	17	20	17
40	4253257089	391302	1.44	17	21	17
41	314244330625	3363450	1.62	17	19	17
42	790321	0	1.42	4	2	4
43	2003999803129	8493762	1.93	17	17	17
44	1003721455881	6011154	1.78	17	18	17
45	2005875369	0	1.43	4	2	4
46	84102900025	1740030	1.52	17	20	17
47	10500192160000	0	2.60	4	7	4
48	1099055104	0	1.43	4	2	4
49	31684000000	0	1.48	4	2	4

No.	Total assets squared	Total assets x total score	Prediction of index score using a and b calculated below	Total variance = (total score less mean of predictions)^2	Unexplained variance = (total score - prediction)^2	(Total score less mean of total score)^2
50	34257609000000	11706000	3.55	0	2	0
51	1106001375556	3154998	1.80	1	1	1
52	98447847696	0	1.53	4	2	4
53	19768360000	0	1.47	4	2	4
54	893049570169	0	1.76	4	3	4
55	1423540106884	2386244	1.85	0	0	0
56	39598612036	397988	1.49	0	0	0
57	51305874064	0	1.50	4	2	4
58	147830253169	1922435	1.56	9	12	9
59	374138965561	0	1.64	4	3	4
60	242416400164	0	1.60	4	3	4
61	7522721446564	0	2.42	4	6	4
62	1120792755625	3176025	1.80	1	1	1
63	21072877225	0	1.47	4	2	4
64	5269118247936	0	2.25	4	5	4
65	158532181921	0	1.56	4	2	4
66	103222766089	0	1.54	4	2	4
67	700061869809	0	1.72	4	3	4
68	11016005435	0	1.46	4	2	4
69	7913531610000	0	2.44	4	6	4
70	38800441	0	1.42	4	2	4
71	230392320064	0	1.59	4	3	4
72	14996206681	0	1.46	4	2	4
73	1138181724736	8534848	1.81	37	38	37
74	17921444641	0	1.47	4	2	4
75	295995843025	0	1.62	4	3	4
76	3602259753444	5693886	2.11	1	1	1
77	1247179699984	0	1.82	4	3	4
78	1313971593796	0	1.84	4	3	4
79	10766273440000	6562400	2.61	0	0	0
80	85141987681	0	1.52	4	2	4
81	565182189796	0	1.69	4	3	4
82	1595163948004	0	1.88	4	4	4
83	7897224040000	0	2.44	4	6	4
84	3754870729	0	1.44	4	2	4
85	347375044	167742	1.43	50	57	50
86	9400272025	581730	1.45	17	21	17
87	48779581321	2650332	1.50	102	110	102
88	20366429521	0	1.47	4	2	4
89	3217271841	0	1.44	4	2	4
90	56939981641	0	1.51	4	2	4
91	81582783129	0	1.52	4	2	4
92	5729278864	378460	1.45	9	13	9
93	5902695241	0	1.45	4	2	4
94	434263921000000	83356000	9.00	4	25	4
95	37185604000000	12196000	3.64	0	3	0
96	314211076	0	1.42	4	2	4
97	4689130393600	0	2.21	4	5	4
98	98782604209	942891	1.53	1	2	1

No.	Total assets squared	Total assets x total score	Prediction of index score using a and b calculated below	Total variance = (total score less mean of predictions)^2	Unexplained variance = (total score - prediction)^2	(Total score less mean of total score)^2
99	18020025000000	0	2.96	4	9	4
100	70408881000000	117474000	4.47	146	91	146
101	9560464000000	0	2.54	4	6	4
102	21123216000000	0	3.09	4	10	4
103	13848817960000	44656800	2.77	102	85	102
104	1089936000000	0	1.80	4	3	4
105	329007782464	0	1.63	4	3	4
106	11916304	0	1.42	4	2	4
107	170459136	0	1.42	4	2	4
108	56558828041	1189105	1.50	9	12	9
109	8416411081	0	1.45	4	2	4
110	70033800321	793917	1.51	1	2	1
111	1948816000000	0	1.93	4	4	4
112	865771776	0	1.43	4	2	4
113	489756430276	2099478	1.67	1	2	1
114	134861769000000	58065000	5.65	9	0	9
115	15721225	0	1.42	4	2	4
116	33642529561	0	1.48	4	2	4
117	5806440000	76200	1.45	1	0	1
118	59685421636	732918	1.51	1	2	1
119	70703873604	797706	1.52	1	2	1
120	66748900	0	1.42	4	2	4
121	3530855241	0	1.44	4	2	4
122	301994884	0	1.42	4	2	4
123	10465225000000	6470000	2.60	0	0	0
124	51295908196	1132430	1.50	9	12	9
125	14331032353225	15142540	2.80	4	1	4
126	3363768004	115996	1.44	0	0	0
127	76812676801	0	1.52	4	2	4
128	114030810747441	64071126	5.30	17	0	17
129	1616839402500	2543100	1.88	0	0	0
130	3276646564	0	1.44	4	2	4
131	1709739801	0	1.43	4	2	4
132	186650244	0	1.42	4	2	4
133	133888041	0	1.42	4	2	4
134	53642728881	0	1.50	4	2	4
135	297666009	0	1.42	4	2	4
136	4916814400	0	1.44	4	2	4
137	10217570724	0	1.46	4	2	4
138	1231209940801	7767193	1.82	26	27	26
139	55161568225	0	1.50	4	2	4
140	55172372544	0	1.50	4	2	4
141	225630441	0	1.42	4	2	4
142	695729482816	3336416	1.72	4	5	4
143	2358559225	0	1.44	4	2	4
144	6584997904	0	1.45	4	2	4
145	4096576000000	4048000	2.15	0	0	0
146	902641936	0	1.43	4	2	4
147	32622374560000	114232000	3.50	327	272	327

No.	Total assets squared	Total assets x total score	Prediction of index score using a and b calculated below	Total variance = (total score less mean of predictions)^2	Unexplained variance = (total score - prediction)^2	(Total score less mean of total score)^2
148	4927057249	280772	1.44	4	7	4
149	5355312400	292720	1.44	4	7	4
150	545362609	0	1.43	4	2	4
151	190437977664	0	1.58	4	2	4
152	2390190208576	0	1.98	4	4	4
153	94037627290000	38789200	4.95	4	1	4
154	147922544449	0	1.56	4	2	4
155	14240603556	0	1.46	4	2	4
156	3754135441	122542	1.44	0	0	0
157	1311019264	0	1.43	4	2	4
158	48345015625	0	1.50	4	2	4
159	38264054544	0	1.49	4	2	4
160	1750250896	0	1.43	4	2	4
161	1646655241	40579	1.43	1	0	1
162	357438971044	0	1.64	4	3	4
163	65028060036	0	1.51	4	2	4
164	1499006089000000	542038000	15.51	146	2	146
	2791714983536540	**1337218304**	**315**	**1834**	**1506**	**1834**
		mean =	1.92			sqrt = 42.825

No.	International shareholders squared	International shareholders x total score	Prediction of index score using a and b calculated below	Total variance = (total score less mean of predictions)^2	Unexplained variance = (total score - prediction)^2	(Total score less mean of total score)^2
1	0	0	2.02	102	100	102
2	0	0	2.02	4	4	4
3	0	0	2.02	1	1	1
4	0	0	2.02	37	36	37
5	0	0	2.02	0	0	0
6	0	0	2.02	1	1	1
7	0	0	2.02	102	100	102
8	0	0	2.02	4	4	4
9	1	0	0.67	4	0	4
10	0	0	2.02	4	4	4
11	0	0	2.02	26	25	26
12	0	0	2.02	4	4	4
13	0	0	2.02	4	4	4
14	0	0	2.02	4	4	4
15	0	0	2.02	1	1	1
16	1	3	0.67	1	5	1
17	0	0	2.02	4	4	4
18	0	0	2.02	4	4	4
19	0	0	2.02	1	1	1
20	0	0	2.02	4	4	4
21	0	0	2.02	4	4	4
22	0	0	2.02	17	16	17
23	0	0	2.02	4	4	4
24	0	0	2.02	4	4	4
25	1	0	0.67	4	0	4
26	0	0	2.02	4	4	4
27	0	0	2.02	4	4	4
28	0	0	2.02	4	4	4
29	0	0	2.02	4	4	4
30	0	0	2.02	4	4	4
31	0	0	2.02	4	4	4
32	0	0	2.02	4	4	4
33	0	0	2.02	1	1	1
34	0	0	2.02	1	1	1
35	0	0	2.02	4	4	4
36	0	0	2.02	1	1	1
37	0	0	2.02	1	1	1
38	0	0	2.02	17	16	17
39	0	0	2.02	17	16	17
40	0	0	2.02	17	16	17
41	0	0	2.02	17	16	17
42	0	0	2.02	4	4	4
43	0	0	2.02	17	16	17
44	0	0	2.02	17	16	17
45	0	0	2.02	4	4	4
46	0	0	2.02	17	16	17
47	0	0	2.02	4	4	4
48	0	0	2.02	4	4	4
49	0	0	2.02	4	4	4

No.	International shareholders squared	International shareholders x total score	Prediction of index score using a and b calculated below	Total variance = (total score less mean of predictions)^2	Unexplained variance = (total score - prediction)^2	(Total score less mean of total score)^2
50	0	0	2.02	0	0	0
51	0	0	2.02	1	1	1
52	0	0	2.02	4	4	4
53	0	0	2.02	4	4	4
54	0	0	2.02	4	4	4
55	0	0	2.02	0	0	0
56	0	0	2.02	0	0	0
57	0	0	2.02	4	4	4
58	0	0	2.02	9	9	9
59	0	0	2.02	4	4	4
60	0	0	2.02	4	4	4
61	0	0	2.02	4	4	4
62	0	0	2.02	1	1	1
63	0	0	2.02	4	4	4
64	0	0	2.02	4	4	4
65	0	0	2.02	4	4	4
66	0	0	2.02	4	4	4
67	0	0	2.02	4	4	4
68	0	0	2.02	4	4	4
69	0	0	2.02	4	4	4
70	0	0	2.02	4	4	4
71	1	0	0.67	4	0	4
72	0	0	2.02	4	4	4
73	0	0	2.02	37	36	37
74	1	0	0.67	4	0	4
75	0	0	2.02	4	4	4
76	0	0	2.02	1	1	1
77	0	0	2.02	4	4	4
78	0	0	2.02	4	4	4
79	0	0	2.02	0	0	0
80	0	0	2.02	4	4	4
81	0	0	2.02	4	4	4
82	0	0	2.02	4	4	4
83	0	0	2.02	4	4	4
84	0	0	2.02	4	4	4
85	0	0	2.02	50	49	50
86	0	0	2.02	17	16	17
87	0	0	2.02	102	100	102
88	0	0	2.02	4	4	4
89	0	0	2.02	4	4	4
90	0	0	2.02	4	4	4
91	0	0	2.02	4	4	4
92	0	0	2.02	9	9	9
93	0	0	2.02	4	4	4
94	0	0	2.02	4	4	4
95	0	0	2.02	0	0	0
96	0	0	2.02	4	4	4
97	1	0	0.67	4	0	4
98	0	0	2.02	1	1	1

No.	International shareholders squared	International shareholders x total score	Prediction of index score using a and b calculated below	Total variance = (total score less mean of predictions)^2	Unexplained variance = (total score - prediction)^2	(Total score less mean of total score)^2
99	0	0	2.02	4	4	4
100	0	0	2.02	146	144	146
101	0	0	2.02	4	4	4
102	0	0	2.02	4	4	4
103	0	0	2.02	102	100	102
104	0	0	2.02	4	4	4
105	0	0	2.02	4	4	4
106	0	0	2.02	4	4	4
107	0	0	2.02	4	4	4
108	0	0	2.02	9	9	9
109	1	0	0.67	4	0	4
110	0	0	2.02	1	1	1
111	0	0	2.02	4	4	4
112	0	0	2.02	4	4	4
113	0	0	2.02	1	1	1
114	1	5	0.67	9	19	9
115	0	0	2.02	4	4	4
116	0	0	2.02	4	4	4
117	0	0	2.02	1	1	1
118	0	0	2.02	1	1	1
119	0	0	2.02	1	1	1
120	0	0	2.02	4	4	4
121	0	0	2.02	4	4	4
122	1	0	0.67	4	0	4
123	0	0	2.02	0	0	0
124	0	0	2.02	9	9	9
125	0	0	2.02	4	4	4
126	0	0	2.02	0	0	0
127	0	0	2.02	4	4	4
128	0	0	2.02	17	16	17
129	0	0	2.02	0	0	0
130	0	0	2.02	4	4	4
131	0	0	2.02	4	4	4
132	0	0	2.02	4	4	4
133	0	0	2.02	4	4	4
134	0	0	2.02	4	4	4
135	0	0	2.02	4	4	4
136	1	0	0.67	4	0	4
137	0	0	2.02	4	4	4
138	0	0	2.02	26	25	26
139	1	0	0.67	4	0	4
140	0	0	2.02	4	4	4
141	0	0	2.02	4	4	4
142	0	0	2.02	4	4	4
143	0	0	2.02	4	4	4
144	1	0	0.67	4	0	4
145	0	0	2.02	0	0	0
146	0	0	2.02	4	4	4
147	0	0	2.02	327	323	327

No.	International shareholders squared	International shareholders x total score	Prediction of index score using a and b calculated below	Total variance = (total score less mean of predictions)^2	Unexplained variance = (total score - prediction)^2	(Total score less mean of total score)^2
148	0	0	2.02	4	4	4
149	0	0	2.02	4	4	4
150	0	0	2.02	4	4	4
151	0	0	2.02	4	4	4
152	0	0	2.02	4	4	4
153	0	0	2.02	4	4	4
154	0	0	2.02	4	4	4
155	0	0	2.02	4	4	4
156	0	0	2.02	0	0	0
157	0	0	2.02	4	4	4
158	0	0	2.02	4	4	4
159	0	0	2.02	4	4	4
160	0	0	2.02	4	4	4
161	0	0	2.02	1	1	1
162	0	0	2.02	4	4	4
163	0	0	2.02	4	4	4
164	0	0	2.02	146	144	146
	12	**8**	**315**	**1834**	**1814**	**1834**

No.	Company	Year end		Total score	Total assets (R000s)	International shareholders 1=internat. 0=no internat.
1	Amcoal	31 March	1991	12	2506613	0
2	G.F. Coal	31 December	1990	1	223118	0
3	Trans Ntl	30 June	1990	8	1337300	0
4	Vierfnt.	31 March	1991	2	2523	0
5	Wankie	28 February	1991	1	274436	0
6	Wit Cols	30 September	1990	12	1594541	0
7	De Beers	31 December	1990	7	11432000	0
8	Dbn-DP	31 Dec	1990	3	199091	0
9	ERPM	31 Dec	1990	3	667207	1
10	ET Cons	30 June	1991	3	240682	0
11	Grootvl	31 December	1990	6	83863	0
12	Village	30 June	1991	3	24284	0
13	Vlaks	30 June	1991	3	8353	0
14	W Nigel	31 March	1991	3	39737	0
15	W R Cons	31 December	1990	3	70673	0
16	Bracken	30 September	1990	6	55455	0
17	Kinross	30 September	1990	6	346342	0
18	Leslie	30 Sept	1990	6	65217	0
19	Winkels	30 Sept	1990	6	560575	0
20	Buffels	30 June	1991	6	1415627	0
21	Harties	30 June	1991	6	1001859	0
22	Stilftn	31 December	1990	6	290005	0
23	Fregold	31 March	1991	2	5853000	0
24	Harmony	30 June	1990	3	1051666	0
25	St Helena	31 December	1990	2	1193122	0
26	Unisel	30 September	1990	2	198994	0
27	Blyvoor	30 June	1991	5	384487	0
28	Elands	31 December	1991	3	1058675	0
29	Palamin	31 December	1990	8	1066856	0
30	Samanco	30 June	1991	3	1897962	0
31	Implats	30 June	1991	2	3281200	0
32	Uni Tin	31 December	1990	9	18638	0
33	Con Mrch	30 June	1990	6	96955	0
34	Gefco	31 December	1990	12	220861	0
35	Msauli	31 December	1990	5	75692	0
36	Anglos	31 March	1991	4	20839000	0
37	Angvaal	30 June	1991	2	6098000	0
38	Consmhg	31 March	1990	3	314297	0
39	Gencor	31 August	1990	14	8391000	0
40	Randmin	30 September	1990	12	3721400	0
41	Duiker	30 September	1990	5	237821	0
42	Egoli	31 March	1990	3	264639	0
43	Mid Wits	30 June	1991	3	699826	0
44	Minorco (US$)	30 June	1991	5	11613000	1
45	Rand Lon	31 March	1989	1	76200	0
46	R M Props	30 September	1990	3	244306	0
47	Southgo	31 December	1990	3	265902	0
48	AECI	31 December	1990	2	3235000	0
49	Chemserve	31 December	1990	5	226486	0

No.	Company	Year end		Total score	Total assets (R000s)	International shareholders 1=internat. 0=no internat.
51	Manro	30 June	1990	2	57998	0
52	Sasol	25 June	1991	6	10678521	0
53	Senchem	31 August	1991	2	1271550	0
54	Consol	30 June	1991	7	1109599	0
55	Holdain	31 August	1990	4	834104	0
56	Nampak	30 September	1990	2	2024000	0
57	Sappi	28 February	1991	20	5711600	0
58	SunPak	31 August	1990	4	70193	0
59	Sunvest		1990	4	73180	0
60	Iscor		1991	4	9697300	0
61	Laser	31 December	1990	2	61271	0
62	Suregro		1989	1	40579	0
63	Eskom	31 December	1990	14	38717000	0
TOTALS				**315**	**169197016**	**2**
			Mean =	5.00		

No.	Total assets squared	Total assets x total score	Prediction of index score using a and b calculated below	Total variance = (total score less mean of predictions)^2	Unexplained variance = (total score - prediction)^2	(Total score less mean of total score)^2
1	6283108731769	30079356	4.96	49	50	49
2	49781641924	223118	4.45	16	12	16
3	1788371290000	10698400	4.70	9	11	9
4	6365529	5046	4.40	9	6	9
5	75315118096	274436	4.46	16	12	16
6	2542561000681	19134492	4.76	49	52	49
7	130690624000000	80024000	6.95	4	0	4
8	39637226281	597273	4.45	4	2	4
9	445165180849	2001621	4.55	4	2	4
10	57927825124	722046	4.46	4	2	4
11	7033002769	503178	4.42	1	2	1
12	589712656	72852	4.41	4	2	4
13	69772609	25059	4.40	4	2	4
14	1579029169	119211	4.41	4	2	4
15	4994672929	212019	4.42	4	2	4
16	3075257025	332730	4.41	1	3	1
17	119952780964	2078052	4.48	1	2	1
18	4253257089	391302	4.42	1	3	1
19	314244330625	3363450	4.53	1	2	1
20	2003999803129	8493762	4.72	1	2	1
21	1003721455881	6011154	4.63	1	2	1
22	84102900025	1740030	4.47	1	2	1
23	34257609000000	11706000	5.70	9	14	9
24	1106001375556	3154998	4.64	4	3	4
25	1423540106884	2386244	4.67	9	7	9
26	39598612036	397988	4.45	9	6	9
27	147830253169	1922435	4.49	0	0	0
28	1120792755625	3176025	4.64	4	3	4
29	1138181724736	8534848	4.64	9	11	9
30	3602259753444	5693886	4.82	4	3	4
31	10766273440000	6562400	5.13	9	10	9
32	347375044	167742	4.41	16	21	16
33	9400272025	581730	4.42	1	2	1
34	48779581321	2650332	4.45	49	57	49
35	5729278864	378460	4.42	0	0	0
36	434263921000000	83356000	9.04	1	25	1
37	37185604000000	12196000	5.76	9	14	9
38	98782604209	942891	4.47	4	2	4
39	70408881000000	117474000	6.27	81	60	81
40	13848817960000	44656800	5.23	49	46	49
41	56558828041	1189105	4.46	0	0	0
42	70033800321	793917	4.46	4	2	4
43	489756430276	2099478	4.56	4	2	4
44	134861769000000	58065000	6.99	0	4	0
45	5806440000	76200	4.42	16	12	16
46	59685421636	732918	4.46	4	2	4
47	70703873604	797706	4.46	4	2	4
48	10465225000000	6470000	5.12	9	10	9
49	51295908196	1132430	4.45	0	0	0

No.	Total assets squared	Total assets x total score	Prediction of index score using a and b calculated below	Total variance = (total score less mean of predictions)^2	Unexplained variance = (total score - prediction)^2	(Total score less mean of total score)^2
50	14331032353225	15142540	5.24	1	2	1
51	3363768004	115996	4.42	9	6	9
52	114030810747441	64071126	6.78	1	1	1
53	1616839402500	2543100	4.69	9	7	9
54	1231209940801	7767193	4.65	4	6	4
55	695729482816	3336416	4.59	1	0	1
56	4096576000000	4048000	4.85	9	8	9
57	32622374560000	114232000	5.67	225	205	225
58	4927057249	280772	4.42	1	0	1
59	5355312400	292720	4.42	1	0	1
60	94037627290000	38789200	6.56	1	7	1
61	3754135441	122542	4.42	9	6	9
62	1646655241	40579	4.41	16	12	16
63	1499006089000000	542038000	13.01	81	1	81
	2662810634855230	**1337218304**	**315**	**864**	**755**	**864**
						sqrt =
		mean =	5.00			29.394

No.	Company	Year end		Total score	Total assets (R000s)	International shareholders 3=internat. 0=no internat.
1	Brdacre	30 June	1991	0	4096	1
2	ERPM	31 Dec	1990	3	667207	1
3	Osprey	30 June	1990	0	18857	1
4	Botrest	31 December	1990	0	479992	1
5	Z.C.I.	30 June	1991	0	133871	1
6	Charter (UK)	31 March	1991	0	2165440	1
7	E Dagga	31 March	1991	0	91741	1
8	Minorco (US$)	30 June	1991	5	11613000	1
9	Zaiplat	31 March	1990	0	17378	1
10	Coates	31 December	1990	0	70120	1
11	Copi	30 June	1991	0	234865	1
12	Metaclo	31 December	1990	0	81148	1
	TOTALS			**8**	**15577715**	**12**
			Mean =	0.67		

No.	International shareholders squared	International shareholders x total score	Prediction of index score using a and b calculated below	Total variance = (total score less mean of predictions)^2	Unexplained variance = (total score - prediction)^2	(Total score less mean of total score)^2
1	1	0	0.00	0	0	0
2	1	3	0.00	9	9	5
3	1	0	0.00	0	0	0
4	1	0	0.00	0	0	0
5	1	0	0.00	0	0	0
6	1	0	0.00	0	0	0
7	1	0	0.00	0	0	0
8	1	5	0.00	25	25	19
9	1	0	0.00	0	0	0
10	1	0	0.00	0	0	0
11	1	0	0.00	0	0	0
12	1	0	0.00	0	0	0
	12	**8**	**0**	**34**	**34**	**29**

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