

An investigation into problem areas related to rehabilitation management accounting

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Abstract

The opinions of rehabilitation and environmental managers in the mining industry were researched. There opinions were obtained to questions about the adequate allocation of environmental costs, the visibility of environmental costs, and the influence of a culture of traditional values, beliefs and mindsets, and the evaluation of environmental inputs and gains in non-financial terms. Although an awareness of these problem areas was found, there nevertheless appear to be shortcomings in the actual application of the underlying management accounting principles.

Key words

Environmental costs
Non-financial evaluation

Invisible environmental costs
Inadequate allocation

1 Introduction

1.1 Background

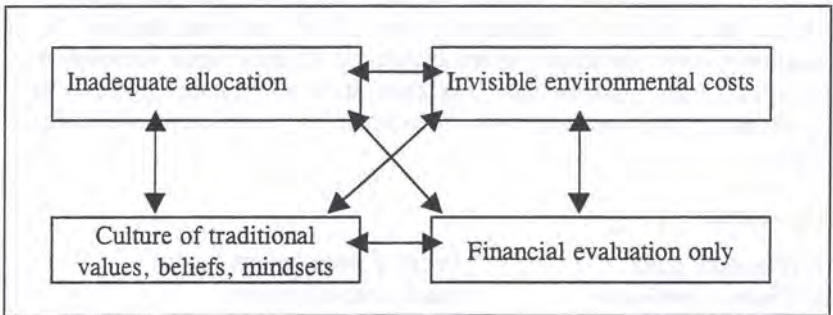
Besides its enormous contribution to the economy of the country, the mining industry also has negative environmental impacts, owing to pollution. One example is the pollution legacy of asbestos mining which, in non-financial terms, caused extensive ill-health for decades after the closure of these mines (Koch, Cooper & Coetzee 1990:3) as well as about 5 000 deaths (Swart 1998:3). In financial terms, it would cost R2,5 million per annum over a period of six years to reshape, rehabilitate and vegetate abandoned asbestos waste dumps (Anonymous 1988:195,198).

1.2 The problem

1.2.1 Introduction

Traditional management accounting approaches did not make provision for the adequate allocation, separation and disclosure of environmental and rehabilitation expenditure. One problem area is that these costs can be regarded as invisible because management with traditional values, beliefs and mindsets regarded these costs as unimportant or unnecessary. Evaluation of input and gains was done in financial terms only, omitting non-financial indicators, such as of pollution levels. The identified problem areas and the interaction of these problems are illustrated in Figure 1.

Figure 1: Interaction of related problem areas on rehabilitation management accounting



1.2.2 Inadequate allocation of environmental and rehabilitation expenditure

The inadequate allocation of rehabilitation and environmental costs forms part of a global tradition of the externalisation of these costs to be paid by future generations. Rehabilitation and environmental costs are inadequately allocated because environmental costs are included in categories such as wages, supplies and sundry expenses (Ansari, Bell, Klammer & Lawrence 1997: MMEC-6), and are not collected, classified, assessed and disclosed properly. All interested and affected parties are not taken into account when these expenditures are not separated for purposes of the provision of information for management decision-making. Traditional management accounting systems tolerated inadequate allocation of rehabilitation and environmental costs (James 1966:157) because these costs were not made visible and separated into financial and non-financial inputs and gains (Smith 1995:178).

1.2.3 Invisible environmental costs

Environmental and rehabilitation costs are hidden in the form of environmental damage to be paid by future generations, both in financial and non-financial terms. One example is the legacy of a "devastated land surface" (Lang 1995:194) from the mining activities of coal miners in the days before environmental awareness. These are remediation liabilities, therefore, both for rehabilitation pertaining to current mining activities and ecological damage inherited from previous generations.

Traditionally, accounting systems did not distinguish environmental costs from other costs and overheads, which resulted in a lack of awareness of the extent of these costs (Ansari *et al.* 1997: MMEC-6). Since environmental costs are kept invisible, adequate provision cannot be made in terms of prevention, control, assessment and failure costs (Ansari *et al.* 1997: MMEC-9) in environmental and rehabilitation budgets.

The lack of regular assessments of rehabilitation and environmental inputs and gains in financial and non-financial terms preserves the traditional view of hiding costs which minimise negative environmental impact. Because of the invisibility of the environmental and rehabilitation costs, the present generation cannot effect adequate allocation.

1.2.4 Traditional values, beliefs and mindsets

Cultural attitudes of beliefs, values and mindsets collectively guide the behaviour of people and determine how "values are used to interpret the meaning of accounting measures" (Ansari *et al.* 1997:SMA-12). Owing to a culture of traditional values, beliefs and mindsets, the interested and affected groups have different interpretations of costs incurred for purposes of rehabilitation and the conservation of the environment. Some regard costs to remediate ecological damage and to preserve natural habitats as unnecessary. In poor and developing countries, in particular, there is an attitude that compulsory remediation operations on uncontrolled small scale mining sites would lower the standard of living for millions of people (Kumalo 1995:28; Holloway 1995:23).

At the same time, when the importance of ecological rehabilitation is actually recognised, it is only to comply with environmental legislation in order to avoid or reduce environmental failure costs. The values, beliefs and mindsets should be developed to the next phase where environmental and rehabilitation expenditure are included in the accounting system (Schmidheiny 1992: 333) under environmental prevention costs, which would result in no ecological damage being left to future generations.

Changed values, beliefs and mindsets would enable the management team which includes the management accountant, to identify and adequately assign financial and non-financial environmental and rehabilitation issues which have been regarded as invisible.

1.2.5 Evaluation in financial terms only

According to accounting and management accounting tradition inputs and results should be measured in financial terms only (Ansari *et al.* 1997:MMQC-4). This resulted in a culture of short-term manipulation of historical financial data in the provision of information for management decision-making purposes. The provision of financial data, measuring of performance and evaluation of resource usage occur after the fact (Ansari *et al.* 1997:TC-23), without making projections for future activities, such as rehabilitation projects.

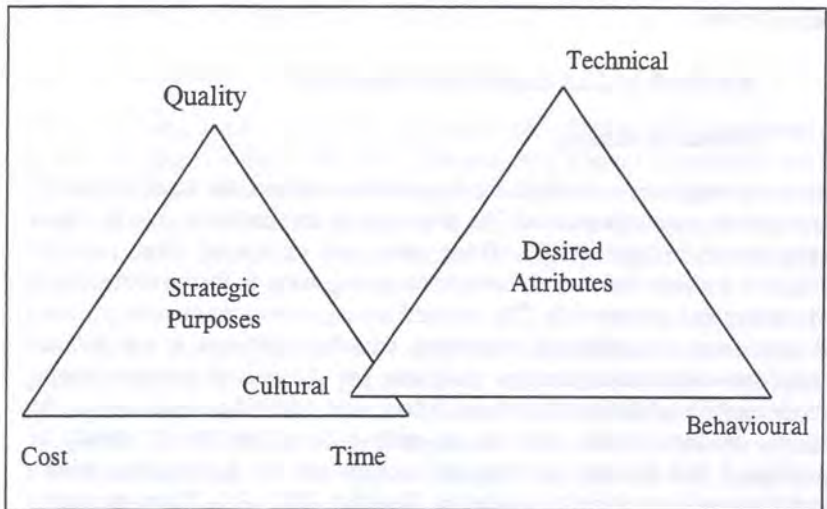
Adequate provision has not been made for the measurement of non-financial input and results. In rehabilitation and environmental management, however, it is essential, for example, to assess pollution levels and to compare these readings with previous levels and recommended levels. Information provided by the management accountant on pollution effects and the extent of ecological damage forms the basis for calculations and decision-making.

An ecologically conscious sector of the community increasingly demands information on environmental damage (Cairncross 1995:188), such as that caused by mining operations, and corrective measures taken. The existing historical financial information should be supplemented with non-financial information in order to communicate to the public and stakeholders (Smith 1990: 26).

Evaluation in financial terms only was not previously questioned because traditional views allowed environmental costs to be hidden, disguised and not adequately allocated.

1.2.6 Problem in perspective

Figure 2: Interaction of background elements to the problem areas



(Source: Ansari *et al.* 1997: SMA-14)

The mutual dependence and reinforcement of strategic elements and the attributes of management accounting upon each other are illustrated in Figure 2. The strategic elements outline the relevance of decisions based on the method for the provision of information for the management of costs, quality and time. If management accounting information or methods could improve cost management, improve quality or reduce time, the information has decision relevance. According to the desired attributes of management accounting, "management accounting information should have the technical properties of decision relevance and process understanding" (Ansari *et al.* 1997: SMA-14). Behavioural attributes refer to the ways that measurements affect behaviour, and cultural attributes refer to values, beliefs and mindsets contained in measures.

1.3 Objective of the investigation

The objective of the empirical investigation was to determine the opinions of all environmental and rehabilitation managers in the mining industry in South Africa on management accounting procedures and policies which seem to be problem areas. These opinions will supplement existing literature references on the subject of rehabilitation management accounting. Knowledge of these opinions would form a basis for future positive developments in managerial rehabilitation accounting strategies in the mining industry. These opinions would

reflect current attitudes towards rehabilitation management accounting as well as deficiencies in the treatment of environmental expenditure. They would give an indication of attitudes towards the adequate allocation of environmental expenditure, the visibility of these costs, the influence of traditional values, beliefs and mindsets on decision making, and performance evaluation in non-financial terms.

2 Method of the empirical research

2.1 Research design

After comparing various methods for the collection of data, the facsimile facility was chosen as a suitable method. The investigating area included only the major mining sectors in South Africa. These mines and groups of mines have the potential to become leaders in rehabilitation management in their own industrial environment and countrywide. The selected mining sectors were gold, platinum and silver, coal, and asbestos, chromium, vanadium and iron. It was deduced from observations and a literature study that not all types of mining activities cause extensive pollution to the air, water and soil. Diamond mines, for instance, produce muddy water as the main effluent, but then it should be remembered that erosion of riverbanks occurs and the surrounding mining population could cause severe pollution (Hocking 1983: 46). There are only a few large diamond mines in the country. Most diamond mining operations are still performed by short-term individual fortune-seekers who cannot be traced in the records (Department of Minerals and Energy 1997). The same arguments could be advanced for the mining of aggregate and sand, phosphates and various types of stone, such as limestone, for example.

Since the total initial target population consisted of 142 units, attempts were made to send questionnaires to all potential respondents in this population survey. Because of the possibility of potential respondents being sensitive about their rehabilitation operations, only their opinions were required instead of answers to direct questions.

2.2 The questionnaire

The questionnaire consisted of statements and provision was made for five categories of responses by the mine or environmental managers. They had to decide to what degree they personally agreed or disagreed with the statements. Statements were aimed at acquiring the respondents' opinions on what they should do and what they actually do in respect of rehabilitation management. The five categories applied in this research were strongly agree (SA), agree (A), uncertain (U), disagree (D) and strongly disagree (SD). The uncertain option was added to diminish guessing and provide for a lack of knowledge on the particular subject.

The observation is that the environmental and rehabilitation managers in South Africa have a high average level of academic proficiency. They are mostly engineers, but also include a variety of other occupations which are representative of various disciplines. Therefore provision was not made in the questionnaire for definitions of concepts.

2.3 Response and statistical analysis

Out of the total listed initial target population of 142 units, 123 units could be reached by fax. Of these, 48 were returned, which gives a response rate of 39,02%. The 19 units of the initial target population that could not be reached were either from mines which closed down for economic reasons, or were smaller mining enterprises that no longer exist (Department of Mineral and Energy 1997).

Although a usable response of 39,02% was received, the response was not generalised over the whole population of environmental and rehabilitation managers in the gold-mining and coal-mining industries and the other smaller categories. The deductions are only applicable to the mines or groups of mines that responded to the questionnaire. A response rate of 39,02% in a population survey like this one could be regarded as satisfactory.

As the number of responses in this empirical study was a relatively small figure (less than 100), even with a satisfactory response rate, care had to be taken to ensure that meaningful conclusions were reached when performing statistical analysis techniques. The combination of a small response figure and a relatively large number of statements (29) further complicated statistical comparisons.

The categories for agreement, strongly agree (SA) and agree (A), were grouped together, as were the categories for disagreement, strongly disagree (SD) and disagree (D). Whenever it was possible to place the majority of the total number of respondents in either of these groups, that particular opinion on the statement would be identified as the *general opinion* of the respondents of the returned questionnaires.

These categories are illustrated by means of simple tabulation, also known as one-way or univariate tabulation. Since the response received exceeded 30, groups of statements could be compared, but care had to be taken regarding overall significance (alpha) levels (Freund 1992:197). As the basis of significance we could be confident that the findings in the survey could be applied to the population (Chadwick, Bahr & Albrecht 1984:370).

When statements compared in this study yielded a response of general agreement of more than 50%, the responses were regarded as comparing favourably, but the percentages of responses indicating both uncertainty and general disagreement could not be completely ignored.

3 Analysis of the responses

3.1 Introduction

Responses to each individual statement are summarised and summaries of each group of statements are given at the end. The groups of statements were divided into four categories according to the problem areas identified. Each group of responses had to be interpreted as a single group and compared with the other groups, since the identified problem areas influence one another.

The dimensions of quality, cost and time of a strategic management accounting approach, as well as the technical, cultural and behavioural attributes of a good management accounting strategy as described by Ansari *et al.* (1997:SMA-14) were also involved in the analysis of the responses.

3.2 Statements relating to inadequate allocation

Statement 1 *Measurable is tantamount to manageable in rehabilitation management.*

| | | | | | |
|----------------------|--------|----------------|--------|----------|------|
| General agreement | 76,1%: | Strongly agree | 26,1%; | Agree | 50% |
| General disagreement | 4,3%: | | | Disagree | 4,3% |
| Uncertain | 19,6% | | | | |

Of all the statements relating to inadequate allocation and disclosure of environmental and rehabilitation expenditure, this one yielded the lowest response (4,3%) for the disagree option by the environmental managers who responded to the questionnaire. A response of 76,1% in general agreement with the statement also indicates a relatively high positive opinion in favour of this element of quality management (Deming 1982: 23). The "uncertain" option, however, gave a response of about one in five environmental managers who were not sure about this statement.

Statement 2 *It is necessary to differentiate between internal rehabilitation value-added and non-value-added environmental cost categories.*

| | | | | | |
|----------------------|------|-------------------|-------|----------|-------|
| General agreement | 60%: | Strongly agree | 7,5%; | Agree | 52,5% |
| General disagreement | 20%: | Strongly disagree | 5% | Disagree | 15% |
| Uncertain | 20% | | | | |

Statement 3 It is necessary to differentiate between internal and external value-added and non-value-added environmental expenditure.

| | | | |
|----------------------|------------------------|----------------|-------|
| General agreement | 57,5%: Strongly agree | 7,5%; Agree | 50% |
| General disagreement | 20%: Strongly disagree | 2,5%; Disagree | 17,5% |
| Uncertain | 22,5% | | |

Although Statements 2 and 3 yielded responses of 60% and 57,5%, respectively, in general agreement that value-added and non-value-added expenditure should be differentiated internally as well as externally, a relatively high number of respondents (20%, 22,5%) chose the "uncertain" option. The concept of added value is a measure of performance, indicating wealth and profits at the micro economic level, created over a period of time (Enthoven 1985: 14). Value-added cost is cost that, if eliminated, would reduce the value stakeholders obtain from using the product or service (Horngren, Datar, Foster & Uliana 1999:1042). The dimension of cost management in terms of the value-added principle is, indeed, present in rehabilitation management accounting according to the responses to these two statements.

Statement 4 Prevention costs are separated from other environmental cost categories.

| | | | |
|----------------------|--------------------------|---------------|-------|
| General agreement | 45,8%: Strongly agree | 6,3%; Agree | 39,6% |
| General disagreement | 37,5%: Strongly disagree | 2,15 Disagree | 35,4% |
| Uncertain | 16,7% | | |

Statement 5 Assessment costs are separated from other environmental cost categories.

| | | | |
|----------------------|--------------------------|--------------|-------|
| General agreement | 50%: Strongly agree | 4,2%; Agree | 45,8% |
| General disagreement | 41,7%: Strongly disagree | 2,1 Disagree | 39,6% |
| Uncertain | 8,3% | | |

Statement 6 Control costs are separated from other environmental cost categories.

| | | | |
|----------------------|--------------------------|--------------|-------|
| General agreement | 58,3%: Strongly agree | 4,2%; Agree | 54,2% |
| General disagreement | 35,4%: Strongly disagree | 2,1 Disagree | 33,3% |
| Uncertain | 6,3% | | |

Statement 7 Failure costs are separated from other environmental cost categories.

| | | | | | |
|----------------------|-------|-------------------|------|----------|-------|
| General agreement | 56,3% | Strongly agree | 4,2% | Agree | 52,1% |
| General disagreement | 27,1% | Strongly disagree | 2,1% | Disagree | 25% |
| Uncertain | 16,7% | | | | |

The subgroup of statements from Statements 4 to 7 dealt with the separation of environmental costs into the categories of prevention costs (Statement 4), assessment costs (Statement 5), control costs (Statement 6) and failure costs (Statement 7) (Ansari *et al.* 1997:MMEC-5; Lawrence & Butler 1995:104). The major groups of activities that lead to the corresponding environmental cost are prevention activities to eliminate potential causes of adverse environmental impacts; assessment activities to measure and monitor potential sources of environmental damage; control activities to contain hazardous substances that are produced or used; and activities that fail and lead to accidental environmental damage. These statements on the separation of environmental costs refer to the dimension of cost management as described by Ansari *et al.* (1997:SMA-5).

Although most of the respondents (45,8%) were in general agreement that prevention costs are separated from other environmental cost categories, no general opinion on the statement could be deduced. Although most of the environmental and rehabilitation managers who responded to these questions (45,8%) agreed that environmental costs are divided into different categories, the overall positive response figures (45,8%; 50%;58,3%; 56,3%) were not as high as one would expect under ideal circumstances (80% to 100%). It seemed that the respondents did not really care whether costs are separated or kept together. This attitude was borne out by the relatively high uncertain responses to some of the statements, namely 16,7%, 8,3%, 6,3% and 16,7%. The difficulty of drawing definite lines between cost categories that tend to overlap might be another reason for this response. Control costs, for example, could be regarded as prevention costs if they could prevent failure costs.

Statement 8 All major groups of rehabilitation costs (Statements 2-7) incurred are disclosed to stakeholders.

| | | | | | |
|----------------------|-------|----------------|-------|----------|-------|
| General agreement | 77,1% | Strongly agree | 10,4% | Agree | 66,7% |
| General disagreement | 16,7% | | | Disagree | 16,7% |
| Uncertain | 6,3% | | | | |

According to the responses of the environmental and rehabilitation managers who responded to this statement, the major groups of rehabilitation expenditure are disclosed to stakeholders. The response to this statement confirmed that the

respondents act in accordance with the technical attribute of the provision of relevant information, and of the behavioural attribute of the management team to promote quality management (Ansari *et al.* 1997:SMA-9).

Statement 9 Expenditure on rehabilitation on an ongoing basis as part of the operating process should be separated from expenditure on rehabilitating damage from the past.

General agreement 77,1%: Strongly agree 18,8%; Agree 58,3%
 General disagreement 14,6%: Strongly disagree 4,2% Disagree 10,4%
 Uncertain 8,3%

Most of the respondents agreed that rehabilitation costs should be divided into two distinct groups: costs in respect of damage inherited from the past and ongoing rehabilitation expenditure.

In the first instance the value of the land would increase after rehabilitation activities had been performed, but in the second case it would remain the same because the rehabilitation expenditure would be regarded as an ongoing expense. This emphasised the importance of the adequate allocation of environmental expenditure. The relatively high response in general agreement with the statement on the separation of rehabilitation expenditure between ongoing and repairing elements also indicated the presence of an attitude which promotes quality, cost and time management in rehabilitation management approaches (Ansari *et al.* 1997:MMEC-2).

Table 1 Results of the investigation into inadequate allocation of environmental costs

| Statement | General agreement | General disagreement | Uncertain |
|-----------|-------------------|----------------------|-----------|
| 1 | 76,1 | 4,3 | 19,6 |
| 2 | 60 | 20 | 20 |
| 3 | 57,5 | 20 | 22,5 |
| 4 | 45,8 | 37,5 | 16,7 |
| 5 | 50 | 41,7 | 8,3 |
| 6 | 58,3 | 35,4 | 6,3 |
| 7 | 56,3 | 27,1 | 16,7 |
| 8 | 77,1 | 16,7 | 6,3 |
| 9 | 77,1 | 14,6 | 8,3 |

Comments on the group of statements relating to inadequate allocation of environmental expenditure (such as summarised in Table 1)

It should be noted that for eight out of the nine statements the respondents indicated more than 10% disagreement, and for five out of the nine statements more than 10% in respect of uncertain. Although most of the rehabilitation and environmental managers who responded to these statements were of the opinion that environmental costs should be and are identified, separated and disclosed as part of the allocation procedure, it can be deduced that this procedure is still in the first stages of evolution.

3.3 Statements relating to invisible environmental costs

Statement 10 Impact assessments are important at the commencement of mining operations.

| | | | | | |
|----------------------|-------|----------------|-------|----------|-------|
| General agreement | 91,5% | Strongly agree | 61,7% | Agree | 29,8% |
| General disagreement | 8,5% | | | Disagree | 8,5% |
| Uncertain | 0 | | | | |

Statement 11 A comprehensive approach ranging from impact assessment to aftercare should be adopted.

| | | | | | |
|----------------------|-------|----------------|-----|----------|-------|
| General agreement | 95,8% | Strongly agree | 50% | Agree | 45,8% |
| General disagreement | 2,1% | | | Disagree | 2,1% |
| Uncertain | 2,1 | | | | |

The strong reaction to Statements 11 and 12 emphasises the importance of impact assessments at the commencement of mining operations, as well as of a comprehensive approach continuing to aftercare. Traditionally, invisible costs are in the process of becoming more visible by introducing impact assessments and following a complete rehabilitation strategy, ranging from impact assessments to aftercare. These two statements combined the strategic dimensions of quality, cost and time, as well as the technical, cultural and behavioural attributes of a good management accounting approach (Ansari *et al.* 1997:SMA-14). Quality management was recognised by including the whole spectrum of rehabilitation operations and visible costs over the duration of mining excavations. The technical attribute of this relevant information on environmental impacts positively influences the work culture, which leads to positive behavioural patterns to be reflected in improved decision-making processes.

Statement 12 Environmental costs should be routinely integrated into management decision-making.

| | | | | | |
|----------------------|-------|----------------|-------|----------|-------|
| General agreement | 95,8% | Strongly agree | 43,8% | Agree | 52,1% |
| General disagreement | 2,1% | | | Disagree | 2,1% |
| Uncertain | 2,1% | | | | |

Statement 13 Designing costs out in respect of rehabilitation management should form an integral part of strategic management.

| | | | | | |
|----------------------|-------|----------------|-------|----------|-------|
| General agreement | 97,9% | Strongly agree | 45,8% | Agree | 52,1% |
| General disagreement | 2,1% | | | Disagree | 2,1% |
| Uncertain | 0 | | | | |

Statements 12 and 13 are examples of efforts to make environmental costs more visible. In both instances very high responses were found in favour of the integration of environmental costs into decision-making (95,8%) and of the designing out of excessive environmental costs (97,9%). The best opportunity to manage costs and make them visible is while the project is still in the design stage. Most costs are committed at the design stage while most rehabilitation costs are incurred after activities start (Ansari *et al.* 1997:TC-4). The rehabilitation and environmental managers who responded to the questionnaire support the dimensions of quality and cost management regarding the visibility of environmental cost as an integral part of strategic management.

Statement 14 Financial provision should be made for long-term rehabilitation management and aftercare.

| | | | | | |
|----------------------|-------|----------------|-------|----------|-------|
| General agreement | 95,8% | Strongly agree | 41,6% | Agree | 54,2% |
| General disagreement | 2,1% | | | Disagree | 2,1% |
| Uncertain | 2,1% | | | | |

Statement 15 The costs of the extended enterprise (on aftercare, consultants, R&D, contractors, suppliers, security, and natural environment) should be determined.

| | | | | | |
|----------------------|-------|----------------|-------|----------|-------|
| General agreement | 87,2% | Strongly agree | 14,9% | Agree | 72,3% |
| General disagreement | 2,1% | | | Disagree | 2,1% |
| Uncertain | 10,6% | | | | |

Rehabilitation and environmental managers responding to Statements 14 and 15 generally agreed that provision should be made for long-term rehabilitation and that the costs of the extended enterprise should be determined. This implied that environmental and rehabilitation managers were of the opinion that environmental expenditures should be made more visible in long-term planning of the extended enterprise, and consequently managed according to quality management principles.

Statement 16 An enterprise's mission statement and objective statement have a positive influence on rehabilitation policies to the extent that they deal with environmental issues.

| | | | | | |
|----------------------|-------|----------------|-------|----------|-------|
| General agreement | 83,3% | Strongly agree | 14,6% | Agree | 68,8% |
| General disagreement | 10,4% | | | Disagree | 10,4% |
| Uncertain | 6,3% | | | | |

When the mission and objective statements included ecological objectives, an awareness of these issues would influence the company culture and behaviour. Company-wide consciousness of environmental costs adds to the visibility of these costs. One respondent mentioned that a distinction should be made between greenwash and true efforts to accomplish acceptable standards of rehabilitation and environmental management. Only if these objectives were reinforced could they have a positive influence on rehabilitation policies.

Statement 17 Monetary rehabilitation inputs are disclosed to stakeholders.

| | | | | | |
|----------------------|-------|-------------------|------|----------|-------|
| General agreement | 64,6% | Strongly agree | 6,3% | Agree | 58,3% |
| General disagreement | 22,9% | Strongly disagree | 2,1% | Disagree | 20,8% |
| Uncertain | 12,5% | | | | |

According to the environmental and rehabilitation managers who responded to the questionnaire, there was general agreement that monetary rehabilitation inputs are disclosed to interested and affected parties. However, responses to this statement also yielded the lowest percentage in general agreement (64,6%), the highest in general disagreement (22,9%), and the highest regarding the "uncertain" option (12,5%) in the group on the visibility of environmental expenditure. This meant that the respondents might regard disclosure to stakeholders as not adequately performed.

Table 2: Results of the statements relating to invisible environmental expenditure

| Statement | General agreement | General disagreement | Uncertain |
|-----------|-------------------|----------------------|-----------|
| 10 | 91,5 | 8,5 | 0 |
| 11 | 95,8 | 2,1 | 2,1 |
| 12 | 95,8 | 2,1 | 2,1 |
| 13 | 97,9 | 2,1 | 0 |
| 14 | 95,8 | 2,1 | 2,1 |
| 15 | 87,2 | 2,1 | 10,6 |
| 16 | 83,3 | 10,4 | 6,3 |
| 17 | 64,6 | 22,9 | 12,5 |

Comments on the group of statements relating to invisible environmental expenditure (as summarised in Table 2)

Although relatively high responses were yielded in favour of the ideal situation on the visibility aspects of environmental costs in Statements 10 to 15, relatively lower responses were yielded in agreement with the actual situation concerning the influence of the mission and objective statements and the disclosure of financial inputs to stakeholders (Statements 16 and 17). These opinions on the visibility aspect of rehabilitation and environmental costs indicated that these costs should be made more visible throughout the management accounting system by separating and identifying them.

3.4 Statements relating to traditional values, beliefs and mindsets

Statement 18 The heritage of badly rehabilitated land is an important factor in strategic management.

General agreement 83,3%: Strongly agree 18,8%; Agree 64,6%
 General disagreement 4,2%: Disagree 4,2%
 Uncertain 12,5

A relatively high response (83,3%) indicated the awareness that a culture and behaviour of negligence regarding rehabilitation management of previous generations is an important factor in strategic management. Provision should be made in strategic plans for the rehabilitation of inherited badly rehabilitated land.

Statement 19 Cultural differences influence the process of rehabilitation management decision-making.

General agreement 56,3%: Strongly agree 0,4%; Agree 45,8%
General disagreement 22,9%: Disagree 22,9%
Uncertain 20,8%

Although general agreement of 56,3% was yielded, about 43% of the respondents disagreed (22,9%) or were uncertain (20,8%) about the influence of differing cultural and traditional values, beliefs and mindsets on decision making on rehabilitation management.

Statement 20 People in the communities surrounding mines are dependent on the natural environment.

General agreement 68,1%: Strongly agree 6,4%; Agree 61,7%
General disagreement 17%: Disagree 17%
Uncertain 14,9%

The fact that people in the communities surrounding mines are actually dependent on the natural environment should be taken into account when deciding on the degree of rehabilitation as part of the rehabilitation policy. These people also form part of the culture of the extended enterprise and are included in the interested and affected groups concerning rehabilitation management.

Statement 21 If there were no laws, regulations and inspections, mine managers would still operate to an ethic of responsibility to preserve the natural environment.

General agreement 37,5%: Strongly agree 8,3%; Agree 29,2%
General disagreement 43,7%: Strongly disagree 10,4%; Disagree 33,3%
Uncertain 18,8%

Most of the respondents were doubtful as to whether all environmental managers could be relied on to uphold a high standard of ethics. One of the respondents mentioned that if the environmental and rehabilitation managers were empowered, they would operate according to an ethic of responsibility to preserve the natural environment. This view emphasised the fact that rehabilitation management does not function on its own, and that individuals and groups in higher positions of power dictate the policies for the rehabilitation managers to follow. Top management seemingly did not always have a conscience about the preservation of land that had been damaged or land waste during and after mining operations. The lack of accountability to stakeholders,

including the natural environment, might originate from a culture that permits or even expects top management to perform actions within the organisation that would be unacceptable outside the work culture of top managers.

Statement 22 True profits are recognised only when none of the stakeholders incur losses from the process of profit generation (Pareto).

| | | | | | |
|----------------------|--------|----------------|--------|----------|-------|
| General agreement | 64,4%: | Strongly agree | 13,3%; | Agree | 51,1% |
| General disagreement | 20%: | | | Disagree | 20% |
| Uncertain | 15,6% | | | | |

Most respondents agreed with this statement about true profits, which originates from Pareto's theory of welfare economics (Perman *et al.* 1996:85) where improvement corresponds to gains by some, while no-one loses.

Statement 23 More expensive rehabilitation processes are preferable when the surrounding community is better informed and educated about the natural environment.

| | | | | | |
|----------------------|--------|-------------------|------|----------|-------|
| General agreement | 25,5%: | Strongly agree | 0; | Agree | 25,5% |
| General disagreement | 49%: | Strongly disagree | 2,2% | Disagree | 46,8% |
| Uncertain | 25,5% | | | | |

In this group of statements on organisational culture, this particular statement yielded the lowest response in general agreement (25,5%), the highest in general disagreement (49%) and the highest for the "uncertain" option (25,5%).

One respondent possibly reflected the situation best by remarking that "a more balanced approach [should] be expected" when deciding on the amount of money to be invested on rehabilitation projects in areas of better informed or less informed surrounding communities. In accordance with the general response, this means that a culture exists that less informed and less educated people in the vicinity of mines should not be negatively affected by cheaper and ineffective rehabilitation procedures. We could deduce that while money is available, whatever the amount, and time and organisational skills are being put into a rehabilitation scheme in any case after extraction operations have been completed, more expensive processes are preferable.

Statement 24 Monetary investments in education and training of the workforce in environmental preservation would lead to the improvement of strategic management approaches.

| | | | | | |
|----------------------|--------|----------------|--------|----------|-------|
| General agreement | 64,6%: | Strongly agree | 20,8%; | Agree | 43,8% |
| General disagreement | 18,8%: | | | Disagree | 18,8% |
| Uncertain | 16,6% | | | | |

About one-third of the respondents indicated disagreement or uncertainty. This attitude is also reflected in a study by the Human Sciences Research Council (HSRC) on environmental awareness among companies in South Africa. The companies interviewed did not allocate time for environmental training, or else dealt with training as and when the need arise, or had been unable to add environmental training to the already heavy load of training (Anonymous 1997).

Statement 25 Local and internal attitudes towards rehabilitation management should be considered for rehabilitation decision-making purposes.

| | | | | | |
|----------------------|--------|----------------|--------|----------|-------|
| General agreement | 81,2%: | Strongly agree | 10,4%; | Agree | 70,8% |
| General disagreement | 4,2%: | | | Disagree | 4,2% |
| Uncertain | 14,6% | | | | |

The relatively high response of general agreement (81,2%) supported the view that environmental and rehabilitation managers are conscious of the fact that local and internal cultural conceptions should be taken into consideration. This emphasised the importance of the role of all interested and affected parties in a system of total quality environmental management.

Statement 26 Positive changes in stakeholder behaviour towards rehabilitation and environmental management are attained by means of education and training.

| | | | | | |
|----------------------|--------|----------------|--------|----------|-------|
| General agreement | 83,3%: | Strongly agree | 14,6%; | Agree | 68,8% |
| General disagreement | 10,4%: | | | Disagree | 10,4% |
| Uncertain | 6,3% | | | | |

A relatively high response of 83,3% indicated that the rehabilitation and environmental managers in general agreed that positive changes in behaviour towards rehabilitation management are attained by means of education and training. These changed mindsets and behaviour are the result of changes in organisational cultural attitudes affected by the technical attribute of a management accounting strategy of the provision of information in the form of training and education programmes (Ansari *et al.* 1997:SMA-12; MMEC-17).

Table 3: Results of the statements relating to the culture of traditional values, beliefs and mindsets

| Statement | General agreement | General disagreement | Uncertain |
|-----------|-------------------|----------------------|-----------|
| 18 | 83,3 | 4,2 | 12,5 |
| 19 | 56,3 | 22,9 | 20,8 |
| 20 | 68,1 | 17 | 14,9 |
| 21 | 37,5 | 43,7 | 18,8 |
| 22 | 64,4 | 20 | 15,6 |
| 23 | 25,5 | 49 | 25,5 |
| 24 | 64,6 | 18,8 | 16,6 |
| 25 | 81,2 | 4,2 | 14,6 |
| 26 | 83,3 | 10,4 | 6,3 |

Comments on the statements relating to traditional values, beliefs and mindsets (as summarised in Table 3)

With the exception of Statement 23, which was formulated in a different manner, the remaining eight statements yielded relatively high responses regarding disagreement and uncertainty when they compared with the responses to the remainder of the questionnaire. This is an indication that the existing culture of traditional values, beliefs and mindsets has a negative influence on current environmental management accounting approaches. Statement 21 on the ethical aspects of environmental expenditure deserves special mention. Only 37,5% (of whom 8,3% strongly agree) of the respondents agreed that mine managers would still operate to an ethic of responsibility to preserve the natural environment if there were no laws, regulations and inspections. This "don't care" culture eventually determines the behaviour in respect of decision-making and the availability of funds for proper rehabilitation operations. Note should also be taken of the fact that rehabilitation and environmental managers do not always have the power to determine the degree of remediation to be effected.

3.5 Statements relating to evaluation in financial terms only

Statement 27 Financial results of rehabilitation inputs are disclosed to stakeholders.

General agreement 79,2%: Strongly agree 20,8%; Agree 58,3%
 General disagreement 12,5%: Strongly disagree 2,1% Disagree 10,4%
 Uncertain 8,3%

Statement 28 Non-financial rehabilitation results are measured.

General agreement 74,5%: Strongly agree 17%; Agree 57,4%
General disagreement 10,6%: Disagree 10,6%
Uncertain 14,9%

Statement 29 Non-financial rehabilitation inputs and gains are disclosed to stakeholders.

General agreement 67,4%: Strongly agree 4,3%; Agree 63%
General disagreement 23,9%: Disagree 23,9%
Uncertain 8,7%

Table 4: Results of the statements relating to evaluation in financial terms only

| Statement | General agreement | General disagreement | Uncertain |
|-----------|-------------------|----------------------|-----------|
| 27 | 79,2 | 12,5 | 8,3 |
| 28 | 74,5 | 10,6 | 14,9 |
| 29 | 67,4 | 23,9 | 8,7 |

Comments on the statements relating to evaluation in financial terms only
(as summarised in Table 4)

When comparing Statements 27, 28 and 29, it can be noticed that a higher percentage of the respondents were of the opinion that financial results of rehabilitation inputs are measured (74,5%) and disclosed (79,2%) than was the case with the disclosure of non-financial input and gains (67,4%). It seems that evaluation in non-financial terms still needs to be extended to at least be of the same importance as evaluation in financial terms.

3.6 Summary

Most of the rehabilitation and environmental managers who responded to the statements relating to the adequate allocation of environmental expenditure were of the opinion that environmental costs should be and are identified, separated and disclosed as part of the allocation procedure. According to this response, it can be deduced that this management accounting procedure is still in the process of development.

Relatively high responses were yielded in favour of the ideal situation in the visibility aspects of environmental costs. Relatively lower responses were

yielded in agreement with the actual situation concerning the influence of the mission and objective statements and the disclosure of financial inputs to stakeholders. The opinions on the visibility aspect of rehabilitation and environmental costs indicated that these costs should be made more visible throughout the management accounting system.

There were indications that the existing culture of traditional values, beliefs and mindsets has a negative influence on current environmental management accounting approaches. This was confirmed by the finding that about one-third of the respondents indicated that mine managers would still operate to an ethic of responsibility to preserve the natural environment if there were no laws, regulations and inspections.

A higher percentage was yielded concerning evaluations in financial terms than in non-financial terms. It seems that preference is given to measurement of rehabilitation and environmental input and results in financial terms only.

4 Conclusions and recommendations

The objective of the empirical study has been reached since better insight into the opinions and attitudes of environmental and rehabilitation managers was obtained.

- Although most of the respondents were of the opinion that environmental costs (prevention, assessment control and failure costs as well as value-added and non-value added costs) should be and are indeed identified, separated and disclosed, it can also be deduced that this procedure is still in its initial stages of development.
- Relatively high responses were obtained in favour of the ideal situation in the visibility of environmental costs, such as provision for impact assessments and aftercare, but relatively lower responses were yielded in agreement with the actual situation. The responses regarding the visibility of environmental and rehabilitation costs indicated that these costs should be made more visible throughout the management accounting system by integrating environmental costs into management decision making.
- The responses to the statements relating to traditional values, beliefs and mindsets indicated that the existing culture has a negative influence on current management accounting approaches. A "don't care" attitude is present, which eventually determines the behaviour in respect of decision making and the availability of funds for rehabilitation operations. A relatively low response, for example, was obtained in agreement that if there were no regulations, managers would still

operate to an ethic of responsibility to preserve the natural environment (Statement 21:37%).

- Evaluation of environmental costs in non-financial terms still needs to be extended since the disclosure of non-financial input and gains yielded lower percentages than for financial disclosure.

Management accountants, who should be included in rehabilitation and environmental management teams, have to become more actively involved in the provision of relevant information for decision-making purposes (as illustrated in Figure 1). Previously invisible environmental expenditure should be identified, categorised and included in information for management decision making. Non-value-adding expenditure should be identified and value-added management accounting should focus on future value creation (Glad & Becker 1994:11). Visibility could be enhanced by means of the adequate allocation of environmental costs. In the process of the provision of relevant information on environmental expenditure negative traditional values, beliefs and mindsets could gradually be changed as part of the cycle of continuous improvement. This relevant information would include non-financial indicators concerning pollution levels, among other things, since both financial and non-financial performance measures are necessary for the evaluation of managerial performance (Horngren *et al.* 1999:289, 972). These non-financial indicators would ensure that environmental expenses were allocated adequately and became visible to stakeholders within a culture of traditional values, beliefs and mindsets.

As part of the management team, however, the management accountant, could provide relevant information on environmental operations in order to positively influence this culture and eventually decision-making as well.

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