CHAPTER 6

REHABILITATION MANAGEMENT IN CANADA, THE UNITED KINGDOM AND THE UNITED STATES OF AMERICA

6.1 INTRODUCTION

The mining industry in South Africa can no longer afford the luxury of investing money in research and development programmes in respect of rehabilitation management in the mining industry if existing rehabilitation procedures in developed countries of the world could be introduced unchanged, or in an adapted form, for local management purposes at lower cost. As social issues such as development programmes, wage increases and pressure from labour unions increasingly claim a greater share of profits, less money is likely to become available for rehabilitation purposes. In many instances choices have to be made in respect of the application of funds between provision for necessities for the poor, and the rehabilitation of damaged land (Department of Environmental Affairs and Tourism 1997:11). In the process of adopting international rehabilitation management techniques, the management accountant would have to face the challenge of playing arbiter when the company has to decide which unacceptable aspects should be excluded, and what investments should be incurred to expand basically good practices.

The objective of this chapter is to investigate rehabilitation management issues in regions such as Canada, the United Kingdom and the United States of America in an effort to find solutions and improved management accounting procedures which could be applied in South Africa. These three regions are regarded representative of the general approaches in developed countries in the world, just as most of Africa could be taken to represent the developing countries. Both stages of development are found in South Africa, although the country is classified as a developing country. It is therefore appropriate to investigate environmental and rehabilitation management systems, the measurement and reporting on environmental efforts, and the role of authorities in order to form a picture of a successful total quality environmental management system. The contribution of the informed environmental management accountant in South Africa is linked to the entire environmental rehabilitation effort in the mining industry.
6.2 CANADA

Figure 6.1 Canada

(Microsoft Bookshelf 1996)

6.2.1 Introduction

Mining rehabilitation management in Canada is of particular importance for the purposes of this investigation as this country is regarded as the most developed country according to the Human Development Report of 1997 released by the United Nations Development Programme (Wrottesley 1997:8).

This region, however, also has a history of dead zones caused by mining activities. About a century ago, between 1896 and 1936, in British Columbia virtually all conifers within 19 kilometres of nickel mining activities were destroyed and 63 kilometres away trees showed signs of retarded growth. An area of 10 400 hectares in Ontario was an environmental disaster area where little or no vegetation survived, and where the fish populations were destroyed in lakes 65 kilometres away, owing to acid pollution from nickel operations. (Young 1992:21.)
Environmental disasters like these have fostered an awareness of the negative financial and non-financial effects of uncontrolled mining operations. As early as 1975 the Centre for Resource Studies at the Queen’s University started a multidisciplinary research programme on the national impact of mining in Canada (Ripley, Redman & Maxwell 1978: iii). The seventh study in the group was on the environmental impact of mining in the country.

The various stages of mining activities are distinguished, and the effects of each one on the biological environment are analysed. The model commences with the exploration phase, which produces temporary and moderate disturbances that increase with the intensity of activities. During the second stage development activities occur that prepare the chosen mining site for production, causing negative environmental effects of a local nature. In the third or extraction phase the ore is conveyed to the surface, generating waste rock. Surface-mining operations cause a far greater tonnage of waste materials. Although environmental damage is caused over a larger area, the effects on the biological environment are local in extent in the extraction phase. During the beneficiation stage or fourth phase, the primary separation is made between the minerals and the undesired elements of the ore. Tailings are reclaimed, but the wind and water erosion distribute dust and potentially toxic substances over larger areas. In the next stage the further processing of the metals occurs. During the last phase the mine is abandoned after the exhaustion of deposits. The effect on the environment is more obvious, with vast areas being disturbed. While the mine is operating, inspections and maintenance management ensure that the waste dumps and roads are in an acceptable condition. The potential for environmental disturbance continues after abandonment until nature is able to stabilise and revegetate the area. (Ripley et al 1978:7-10.)

The research group, however, realised the importance of making design and rehabilitation projections during the initial planning stages for the operation of mines in Canada. Natural stabilisation and revegetation should be encouraged from the start to minimise undesirable consequences in the long term. Planning in the long term as well as in the short term is one of the most important functions of the management accountant, and forms part of the control process in which expected and budgeted information is compared with actual performance, for decision-making purposes (Maher et al 1994:7). This planning function of management accountants worldwide is changing at present. Management accountants are increasingly forming part of an interactive planning team.
of which each member is an expert in a particular field and adds value in the value chain from design to disposition.

Approximately two-thirds of the mines in Canada are surface operations, and produce most of the country’s iron ore, asbestos, coal, copper, lead and zinc. In all phases of management planning natural environmental issues are dealt with in the mining industry. Highly meganised equipment, modified for the extreme climate, as well as sophisticated computerised systems are being used (Singhal, Collins & Fytas 1995:58).

6.2.2 Environmental and rehabilitation management systems

Canada could be regarded as a leading country in many respects in the field of environmental and rehabilitation management accounting systems. This includes aspects such as the functioning of environmental management processes, the presence of ISO14000 elements and leadership characteristics. In this regard the Canadian Mining Journal (1996b: 21) confirms that according to a survey by KPMG, 83% of the Canadian companies in the natural resource and energy industries have an environmental management system in operation. Of these only 10% have all the necessary components to be effective in this management operation. The main reason these (17%) companies gave for not implementing an environmental management strategy at all is that they deal with environmental issues only when required. The survey also found that 44% of these responding companies are interested in ISO14000 certification.

When the findings of this survey are compared with Epstein’s “Corporate environmental performance scorecard” (1996:235), it seems that 10% of the companies in the natural resource and energy industries are complying with all ten of the components of environmental integration criteria. When all the companies under investigation are measured against the criteria of environmental leadership on this scorecard, no company can be regarded as an environmental laggard in the last position. (“Scorecard” is discussed in the next chapters.)

Environmental management systems, techniques and tools are in the process of being standardised globally by the International Organisation of Standardisation (ISO), with its headquarters in Geneva, Switzerland (Powers 1996:53). This will change existing environmental management systems where every mining company has its own perception
of good environmental standards. The Standards Council of Canada and the Canadian Standards Association are taking the lead in developing standards regarding environmental management, and consequently in financial measurement and reporting (Harris 1994:57). The first five standards in the ISO14000 series are based on the Canadian environmental standards (CSA Z750-94) (MacDonald 1996:35). In Canada it is expected that European companies will start refusing to trade with suppliers that are not ISO14000 accredited. Traditionally the management accountant was the last link in the decision-making chain. This situation is in the process of changing, however. It is being replaced by a situation where management accountants are increasingly forming an integral part of each link of this chain.

Symposiums such as the annual Mine Reclamation Symposium in British Columbia, which has been held since 1976, are organised to allow the delegates to exchange knowledge and expertise (Canadian Mining Journal 1996b:21). Financial and non-financial issues concerning water management, computerised planning, rehabilitation policies and management regarding the closure of mines are discussed. At the same time awards are presented in different categories to encourage outstanding achievements in mining rehabilitation programmes. Specific problem areas in rehabilitation management are identified and efforts are made to find cooperative solutions. As acid rock drainage, for example, is a major problem in Canadian mining operations, the British Columbia Acid Rock Drainage (BCARD) task force was founded in 1987 (Singhal et al 1995:61). The aims of this task force were to gather stakeholders from government, industry and academic institutions to discuss the problem, and to find and develop solutions for the prediction, prevention, treatment, and control of acid rock drainage, and the financing of such measures. Then the organisation had to ensure that the mineral resources of the provinces are developed in an environmentally acceptable manner.

Another example of the development of techniques for solving long-term maintenance policy problems is the permanent closure of a site by Gold Corporation of Quebec. An amount of about $5.2 million was invested in a project to "fully" rehabilitate the abandoned area, and enabled the mining directors to "walk away" from the site without the need to maintain it afterwards (Canadian Mining Journal 1997b:39). If one considers the number of taxpayers who would otherwise indirectly contribute towards this rehabilitation project, the community indeed obtained some benefits from this large investment in rehabilitation by the company.
By identifying and assessing problems, and by continuing to find solutions, such as at symposiums or as the BCARD did, managers can apply point five of the fourteen points for management identified by Deming (1982:17). Deming (1982:30,31) propagates the constant improvement of production and service systems, including the continuous reduction of waste, and improvement of quality in every activity. In order to achieve these functions, a wide spectrum of experts should participate in the evaluations, such as management accountants, engineers, chemists, and other people conversant with the problems.

As in South Africa, advanced technology is used in Canada to recover gold profitably from gold mine tailings left over from past mining operations. At Rambler about 80% of the gold contents of tailings are recovered, and the company expects to reach 85% (Canadian Mining Journal 1996b:21). After thirty years of mining operations, the Kidd zinc mine in Ontario developed closure plans in accordance with the provincial government regulations (Canadian Mining Journal 1996a:39). These plans include the returning of waste rock to underground sites, which would eliminate the treatment of runoff water from dumps, the removal of all buildings from the site as well as the revegetation of land. The success of these plans is demonstrated by the fact that the original herd of twelve buffalo introduced to the first rehabilitated land of Kidd in 1974 has grown to about eighty in 1996 (Canadian Mining Journal 1996a:49). Environmentally unacceptable scars of the past could therefore be successfully managed and utilised by future generations who would also lessen their negative impacts.

Hemlo Gold Mines faced immense challenges in the area of management of environmental costs when the closure plan for the mines involved raising the walls of the tailings dams at a cost of millions of dollars (Whiteway 1995b:19). After just more than two years of research and discussions with expert consultants, Hemlo decided to put the tailings underground. If only one-third of the produced tailings could be placed underground, the project would prove worthwhile both from an environmental point of view and from a cost-benefit analysis point of view. Freed truck time which had previously been needed to move tailings is included in the non-financial calculations and gains.

Research and development have reached such an advanced stage in this country that the mining of gold in a national forest is possible where all the tailings can be disposed of by
means of a new technique. In Montana Crown Butte Mines developed a technique which the engineers claim would prevent acid rock drainage from contaminating underground water, and which is decades ahead of other similar projects (Daniels 1994:59). The tailings disposal plan would seal toxic metals to prevent them from seeping into ground water in the surrounding nature reserve and the neighbouring national park. Investments in research and development projects form part of the principle behind quality management which aims at the constant improvement of past and present methods and approaches.

Research in Canada (Klassen & McLaughlin 1996:1212) indicates that firms that received awards for investing in products, designs and processes that minimised their adverse impact on the environment improved their environmental safety systems and developed strong management programmes. Award announcements are associated with greater increases in market valuations, while smaller increases have been observed for industries in environmentally unacceptable industries.

To illustrate this fact, Louvicourt in Val d’Or, Quebec, is regarded as the most advanced, energy efficient, environmentally friendly base metals mine in Canada (Whiteway 1995a:11). The best available know-how combined with the extraordinary efforts of about 600 people over six years of planning culminated in the commencement of operations at these mines. Outstanding initiative, leadership and accomplishment regarding environmental responsibility earned this company the environmental award in 1995 from the Prospectors and Developers Association of Canada (Canadian Mining Journal 1995:39). The tailings facility at the site helped to reduce the original capital costs of the project by about $5 million. Backfill technology developed in South Africa for the return of mined rock waste into the worked-out sections of the mines was also introduced. An important element of quality management can be recognised in the approach at Louvicourt. Time, effort and money were put into thorough strategic management planning which resulted in cost effective and environmentally acceptable operations.

The introduction of quality management measures in Canada is one of the contributing factors to the successes of this country. But there are still management policies that could be improved (Laughlin & Varangu 1991:43) along the lines of the principle of continuous improvement.
6.2.3 Measurement of and reporting on environmental rehabilitation efforts

Canadian mining companies are becoming aware of the challenges involved in calculating and controlling environmental costs more accurately. In this regard Golden Giant estimates that this gold mining company spends 4% of its total production costs on environment-related operations (Whiteway 1994:17).

According to Rubenstein (1992:33), a Canadian accountant, basic accounting concepts should be modified to reflect the real interests of the environmental stakeholders of companies. As an initial step towards the disclosure of these details, he redefined accounting as follows:

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

The essence of measuring and reporting on rehabilitation operations is contained in this definition. Basic accounting concepts are modified in accordance with changing circumstances and emphases, so that they include the depletion of natural resources. The real and unique interests of environmental stakeholders are redefined for assessment and reporting purposes. Not only is traditional historical information evaluated, but projections of future wealth are also made. "Resources consumed" implies that full cost accounting, the cost of the extended enterprise and life cycle costs from design to disposition, are accounted for. Provision is made for the contribution of natural capital which was formerly regarded as free goods, such as water, air and soil. The goods and services which are produced do not include the production of waste, which means that the production processes are aimed at quality management. These goods and services are exchanged with the objective of gaining profits for distribution to the providers of money, labour and the government in the form of taxation.

This definition also promotes public welfare which includes issues such as rehabilitation management and the Pareto condition of efficient resource allocation. The Pareto condition is defined by Miller and Meiners (1987:567) as
... an allocation of goods such that, when compared to any other allocation of goods, all parties are at least as well off and at least one of them is actually better off.

Provision is therefore made for the resources to be preserved and not exploited more than necessary. For waste to be minimised and for care to be taken of the natural environment. In this process transactions are made with future generations, and wealth is created for future use in the form of rehabilitated land for agriculture and recreational facilities. All these accounting actions are in accordance with the views of the stakeholders and stewards of the resources.

Chartered accountants in Canada realise that they should keep abreast of the latest developments in verifying environmental performance and should be able to distinguish between valid environmental data and “greenwash” (Harris 1994:58). To be effective advisers, Harris is of the opinion that accountants should fully understand the economic circumstances of an organisation, the regulations and guidelines of the industry and the influence of the customers.

Environmental pollution and sustainable development is a difficult issue to assess as a general unit of measurement is not readily available. The challenge of comparing human activities with environmental damage is seen at three levels by Laughlin and Varangu (1991:47,48). All the relevant factors should at first be identified, such as emissions into the air, water and soil, and the depletion of land. At the second level a decision should be taken on how to assess these factors. Assessment would probably be carried out in multi stages, as from the tonne of discarded rock to the concentrations of toxic substances in the air. At the last level these figures and results should be brought together in a “balance sheet” to provide information that would make informed decisions possible about options for creating a minimum predetermined standard for a habitable environment. Canadians in the waste management industry, like Laughlin and Varangu (1991:43), are of the opinion that more imaginative management accounting approaches should be developed in order to find solutions to these problems.

Harris (1994:59) reports on an environmental survey conducted by the Canadian Council of Ministers of the Environment to determine future environmental issues. The issue of human health, the urgent need to deal with negative environmental effects, and the need to find assessment criteria led to a response of “How fast will it kill you?” Included in
this question are yardsticks like time in terms of months, years or decades, as well as medical accounts of people in the surroundings. The decline in the numbers of animals ranging from large mammals to insects could also be included in this question. An example of the deterioration of the quality of life owing to unhealthy mining activities could be found in the asbestos industry in South Africa some decades ago.

Ripley et al (1978:147-153) constructed a framework for the measurement of the environmental effects of rehabilitation management as early as 1978. First, all the possible impact areas of mining operations are identified, such as agriculture, forestry, freshwater fisheries, wildlife, recreation areas, the scenic character of the landscape and the health of the people. In the next step values are attached to each of the negative impacts, for example, agricultural or forestry losses caused by mining activities, expressed in dollar terms. It is as difficult now as it was twenty years ago to attach a dollar value to lost resources such as endangered species. Finally these losses are compared with the value of the benefits of mining. According to these models the costs of rehabilitation management are estimated to vary between 3 and 20 percent of the net income in the Canadian base metal mining industry (Ripley et al 1978:151). The large differences are ascribed to the type of ore, the age of the mining installation and to the age of the tailings disposal facilities.

After comparing the negative impacts with the benefits of mining in this model, the total costs of pollution control should be determined. These costs include capital and operating costs varying from the cost of new equipment to the cost of modifying processes, from changed siting and installation costs to changes in the application of materials, the use of less water, and recoveries and reuse policies. Secondary costs such as delays and limitations regarding decisions should also be included. Reclamation costs for covering abandoned tailings and rock dumps, open pits and building structures, are also added to obtain the total cost of rehabilitation management. Non-financial indicators such as the level of pollution control and the time required to reach that level, and the sacrifices of the community if mining activities have to be reduced to accommodate rehabilitation management policies, are also taken into account. In developed countries like Canada, a balance or compromise could be reached by mutual agreement between the rehabilitation managers, including the environmental protection groups, and the community. In South Africa, however, which is a developing country where the people have different cultural backgrounds, other methods should be found to work towards a balance, such as top-
Canadians (Eckel, Fisher & Russell 1992:20) realise the importance of the development of performance measures to assist management and stakeholders in decision making and assessments. To enable management accountants to efficiently assist in decision making, the whole process of decision making should be understood (Drury 1996:8). In this regard a system of target costing is developed which is applied throughout the management accounting process to include the life cycle and value chain of the products and activities (Ansari et al 1997d:TC-3).

Eckel et al (1992:21) emphasise that information concerning the natural environment forms an integral part of the control function of management. Relationships between cause and effect should basically be reflected in these measures. The actions of the company in respect of input, such as the investment of funds, to prevent natural environmental deterioration as a result of operations, would be the cause. The result of these inputs in the form of the actual reduction of harmful substances, such as sulphates and carbon dioxide, into the natural environment, would be the effect. These authors also realise that the effects should be carefully defined in order to endeavour to correctly solve environmental problems.

The Canadian Institute of Chartered Accountants (CICA) (1994:8) proposed a framework for identifying the information to be included in environmental reports. This information briefly consists of the profile of the organisation; its environmental policy, objectives and targets, and its environmental performance analysis. When environmental reports are prepared, the various audiences should be identified and approached in different ways as the individual groups have different information needs (CICA 1994:14,15). Communication should be directed to the employees, the investment community, creditors, suppliers, customers, the community, government, associations in industry, activists, and the media. More specifically accountants should include in their preparation when drawing up financial statements, aspects such as the separation of site restoration costs, environmental capital expenditure, compliance with environmental laws and regulations, and the need for environmental information (Buhr 1994:314).

The CICA (Canadian Institute of Chartered Accountants) Handbook makes provision for methods of accounting for the costs of future removal and site restoration costs (Neu &
Simmons 1996:420,421). Section 3060.39 of the Handbook gives a choice between a deferred charge method and a note disclosure on the one hand, and a choice between a retroactive approach and a prospective approach on the other hand. An annual amount for site restoration costs is determined under the recommended deferred charge method. This amount is charged against current income and offset to the deferred charge account on the balance sheet. The account for deferred charges will continue to increase over time until the actual costs associated with the restoration of the site are incurred. If the costs of future restoration cannot reasonably be determined, the company may choose the note disclosure option.

Since the implementation of Section 3060.39 of the Handbook in December 1991, companies opting for the deferred charge approach may also choose between the retrospective and the prospective application. This choice is largely influenced by the decision regarding the timing of expense recognition by management. The retrospective application is when the asset and liability accounts are adjusted to reflect the site restoration costs as if the company had always been using this method. Retained earnings would reflect an immediate large decrease in respect of charges that should have been deducted from earnings in previous years, but the influence on future earnings would be less. Under the alternative option of prospective application the entire amount of site restoration costs would be taken from future earnings. The CICA expressed the opinion that the retroactive application would be a better way to present financial information, although the prospective application would be easier to perform (Neu & Simmons 1996:426). The companies would be better prepared to absorb the expected future rises in site restoration costs through the absorption of the current costs with retained earnings. Future expenses regarding current liabilities could therefore be lowered.

A corporation’s environmental performance is as important as, or even more important than its financial performance to some stakeholders in Canada. In an effort to satisfy these clients, the CICA issued various publications to chartered accountants in practice, industry, government and academic institutions, such as the CICA research report, Environmental costs and liabilities, Audit of financial statement items affected by environmental matters (Harris 1994:57).

At a symposium where the CICA and the Canadian business community were present discussions were held on how financial reporting might better reflect the information that
users need. The future disclosure of non-financial data and leading indicators about forward-looking information were among the issues that participants generally agreed upon. The CICA is in the process of developing an integrated performance measurement framework to supplement traditional published financial information. This process involves business, education and government organisations, among others (Hague 1997:10).

In Canada the structures already exist for the development of detailed environmental accounting systems, such as the integration of full cost accounting. The principles applied by Ontario Hydro, the largest electrical utility in North America, could be expanded to include mining industries. Full cost accounting is being implemented in order to understand and allocate environmental costs better; to define and quantify the external environmental impacts of the operations better; and to integrate environmental impact and cost information into the planning and decision-making processes (Boone & Howes 1996:22,23) (Figure 6.2). This approach has the potential to improve the management accounting relationships among economic, financial, environmental and human resources and would therefore allow management performance to improve competitiveness.

Figure 6.2 Full cost accounting for environmental management (Ontario Hydro)

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<th>Non-monetised external impacts</th>
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<tr>
<td>Monetised external impacts</td>
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<td>Internal environmental costs</td>
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Long-term aim: internalise external impacts into business decisions

(Adapted from Boone & Howes 1996:23)

The number of options available to mining companies for ensuring that money is available for closure activities has increased as a result of amendments. This has led to more simplified closure plans. In this regard the Peachland copper mine in British Columbia presents an example of the amounts provided in the reclamation funds
(MacDonald 1996: 35). About fifty percent of the total estimated closure expenditure is provided for in a fund for reclamation purposes.

Canadian mining management, including both accountants and management accountants, has made progress towards finding ways to measure and report environmental rehabilitation efforts. This movement is strengthened by the overall advanced level of awareness of rehabilitation effects, or the effects of the lack of rehabilitation, by the majority of the inhabitants of the country.

6.2.4 The role of the authorities

Traditionally the government in Canada, as in South Africa, has encouraged and supported mining and other environmentally degrading operations by means of favourable taxation policies, while re-refining, recycling and reuse of waste materials have not received similar benefits to make the latter activities more cost-effective. During the late 1970s and the 1980s a worldwide awareness of the squandering of natural resources developed, resulting in December 1990 in the Canadian Government’s Green Plan, which provided an initial amount of C$3 billion towards a five year scheme for sustainable development (Laughlin & Varangu 1991:43,44).

Management accountants are aware of the fact that regulations to command and control environmental rehabilitation are moving in the direction of more market-based instruments, such as tradeable emission permits and “green” taxes. According to Harris (1994:57) the “react and cure” and “end-of-the-pipe” approaches to environmental pollution and damage are in the process of being replaced by emphasis on pollution prevention. The latter attitude towards control is not found to such a large extent in South Africa. It would also be difficult to develop such an attitude as South Africa is categorised as a developing country. The social and cultural environment in South Africa differs to a large extent from that of Canada. Local social and cultural differences cause a conflicting situation where the developed group of the population is more inclined to shift towards market-based management, while some of the developing groups might realise that damage has been done as a result of mismanagement and would then react by rehabilitating damaged land afterwards. Some groups would not even notice the damage.

This attitude in Canada of incurring prevention costs rather than rehabilitating at much
greater expense at a later stage also spread to the mining industry, where further developments occurred. A national committee, Mine Environment Neutral Drainage (MEND), was founded in 1988 and consisted of 17 mining companies, three government departments, and the provincial governments of British Columbia, Manitoba, Ontario, Quebec and New Brunswick (Singhal et al. 1995:61). The major objectives announced by MEND include the following:

- To create a comprehensive basis that would allow industry and the authorities to predict long-term management requirements for tailings and waste rock.
- To establish techniques to enable the operation and closure of tailings and waste rock areas in an environmentally acceptable manner which is predictable, timely and affordable.

Although there are considerable variations in environmental regulations governing mining among leading mining producers in industrialised countries, common elements can also be found. In Canada, the USA and Australia the following common approaches to environmental regulations have been identified (SA Mining, Coal, Gold & Base Minerals 1993a: 22 & 36):

- Mining is precluded from areas where environmental losses are considered unacceptable. These areas include wildlife management regions and national parks.
- Environmental impact assessments are required to inform the authorities of the environmental consequences of planned mining activities. Government approval is required, the condition being that preventive measures are in place and that all the necessary alternatives have been identified and considered.
- Permit requirements limit the generation of large amounts of smoke, dust, solid, gaseous and liquid waste materials in the form of overburden, tailings, sludge and toxic water. Discharges to surface and underground water are comprehensively regulated, and the management and monitoring of the effects of pollution on water are receiving increased attention.
- Upon cessation of mining activities the rehabilitation of the surface areas is compulsory. Individual rehabilitation requirements vary, but all of them include revegetation and the protection of water resources.
The first and third approaches are not applied in South Africa, however. Mining still occurs and is permitted in areas which are sensitive to disturbances, such as in natural wetlands and certain coastal regions. Supervisory activities and regulations such as permits for air, water and soil pollution under predetermined circumstances are not yet included in the policies of the authorities. Permits to authorise the emission of contaminated effluent from mines during floods are in the process of being officially recognised. These approaches should be considered and implemented on an experimental basis by the authorities. Management accountants have to observe approaches like these because the developed countries might in future expect similar operations from South African mining companies as a condition for international trade.

Environmental management has become a top priority for many producers since the amendments to the Ontario Mining Act, and to the Canadian environmental legislation (Heffernan 1996:34). Owing to the fact that these legislative measures are constantly changing in order to adapt to changing circumstances, uncertainty surrounds the issues of the regulation of and compliance with certain aspects of this legislation. The Mining Association of Canada (MAC) submitted a statement in this regard to the House of Commons Standing Committee on Energy, Mines and Resources and to the Standing Committee on Finance (Singhal et al. 1995:60). MAC protested that mining companies with proper authorisation to proceed with their mining operations were officially prevented from continuing by public pressure.

During the second half of the 1970s the Canadian Department of the Environment had already drafted regulations and guidelines (Ripley et al.) on

- an environmental code of practice for mines regarding liquid effluents, waste rock and tailings
- the control of effluent from existing mines, and the measurement of toxicity and control of effluent from new, expanded and reopened mines

Recently several environmental guidelines and regulations regarding mine development (Singhal et al. 1995:61) were issued by provinces in Canada. Regulations regarding rehabilitation differ from one province to another. In Alberta a detailed rehabilitation programme for coal mines is required (United Nations 1991:15). This development and rehabilitation plan must include reports on surface disturbance, the management of
surface and ground water, and the control of pollution. In British Columbia regulations require a plan for the protection and rehabilitation of soil and water sources at the time of the closure of the mines.

According to the federal Environmental Assessment and Review Process (EARP) a diamond mine in the Northwest had to conduct environmental and socio-economic studies before it could begin exploration activities (Scales 1995:13). The absence of chemicals in the operating processes, the collection of data and development ways to rehabilitate the area, and the gathering of the opinions of the surrounding populations are all considered to contribute to the success of the prescribed environmental study, as recommended by the authorities.

Under present legislation the directors of mining companies are liable for the long-term aftercare of closed mines, but proposals are developing in the direction of the establishment of a corporate entity that would perform these tasks. The Canadian Mining Journal (1997a: 28) reports that this entity would be financially responsible for the monitoring and reclamation of mining sites after closure before these sites are returned to the government. These proposals are in line with the functions of planning, control and organising of the management accountant (Drury 1996:13), as well as with the aspects of strategic management accounting which are quality, time and cost orientated (Ansari et al 1997c,b: SMA-5, MMEC-2).

When the authorities take the lead in rehabilitation management policies as in Canada, management teams in the mining industry are influenced in a positive way to prevent and reduce the pollution generated by their operations. Under these circumstances the management accountant is aware of tendencies pertaining to cost issues which are in the process of being developed and might be incorporated in future legislation. The management accountant has an important role to play in this team approach towards rehabilitation management initiated by the authorities.

6.2.5 Summary and conclusion

Although the mining industry in Canada is going through lean times, as in South Africa, its rehabilitation and environmental management systems are to a large extent based on total quality environmental management which include keeping pace with the advances
of the high-technology and computer era. Singhal et al (1995:61) confirm that the Canadian mining industry, and in particular the open-pit mining section, manages its environmental programmes very well. Operations relating to abandoned mines, the stability of geotechnical structures, water quality, environmental impact assessments and rehabilitation management accounting are all included in the strategic planning processes. These operations were initiated and are being supported on a continuous basis by the authorities through emphasis on prevention and cost-effectiveness in a market-based environment.

Prevention, assessment, control and failure costs and activities in respect of environmental management accounting (Ansari et al 1997b: MMEC-5) are mostly present and to be distinguished in Canada. The successful environmental management accounting procedures can largely be attributed to the implementation of the aspects of quality, time and cost which form the basis for good strategic management accounting (Ansari et al 1997c: SMA-5).

The management accounting functions of planning, control, organising, communication and motivation (Drury 1996:14,15) are noticeable in the rehabilitation management procedures in the Canadian mining industry. Models have been developed to determine the total financial and non-financial inputs in preventing pollution as well as ways of finding compromises between the various interested and affected groups involved in the different pollution cost categories. The Canadian Institute of Chartered Accountants, as well as the engineering community, contribute to the relative success of total quality environmental management in Canada.

The management accountant is increasingly contributing to decision making on rehabilitation management in this country where research and development have reached one of the most advanced stages in the world.
6.3 THE UNITED KINGDOM

Figure 6.3 United Kingdom

Like South Africa, the United Kingdom has a history of losses suffered in terms of the natural environment in the process of extracting riches from the earth. Since Roman times, 55 BCE (before the common era) to 410 ACE (after the common era) (Scannell 1965:143), 400 000 hectares of agricultural land have been lost as a result of metal mining and smelting (Young 1992:21). Although coal had been mined since the thirteenth century in Britain, the invention of the steam engine during the eighteenth century increased the demand for this fuel (Scannell 1965:754, 762).

Coal mining in Britain actually accounts for less than 20% of the total area of damaged land. However, the coal mines are the centres of industrial and other activities which attract high populations, and which also result in unusable and damaged land, and polluted water and air (Bradshaw & Chadwick 1980:123).

But today it is almost impossible to tell where coal has been mined by means of strip-mining, for example. A well-defined management strategy is followed where the overburden, sub-soil and topsoil are replaced, and drainage of effluents is undertaken to
return the land to its former land-use, or to a different but equally acceptable state (Bradshaw & Chadwick 1980:163).

Apart from the high level of development of the people of the United Kingdom, one of the main reasons for their history of successful environmental management is the relatively high density of the population distribution on the land available. In South Africa the idea of "abundance of land" in the past was one of the major reasons why adequate rehabilitation cost management policies were not introduced or not taken seriously. The argument was that it should not be necessary to spend money when there was enough living space in any case for everyone (as well as for animals and wildlife according to other perspectives). The result was that the quality of the "living space" degraded extensively.

6.3.2 Environmental and rehabilitation management systems

In the United Kingdom the Opencast Executive of the National Coal Board aims to completely restore land to its former use - usually agricultural purposes (Bradshaw & Chadwick 1980:10). As a result of this attitude to rehabilitation management natural environments have often been improved. The Opencast Executive holds a worldwide record of rehabilitation projects which have been performed at a cost that is beneficial even under stringent reclamation conditions (Whitworth 1989:67). A better understanding of environmental costs by management accountants and management could assist companies to increase profits, choose and use materials more efficiently, manage the cost of pollution-generating procedures, determine costs and prices more accurately and improve their general environmental performance (Ranganathan & Ditz 1996:38,39).

Coal mining sites are returned to their former uses in agriculture or as roads, housing or industrial sites or as holes to be filled with refuse from local authorities or with colliery spoil and backfill from nearby active mines (World Mining Equipment 1984:37). Farmland is being returned to the community while the mining work is in progress. In 1987 £9 million were spent by the Executive on 18 projects, including all kinds of rehabilitation schemes (Whitworth 1989:73). Apart from direct rehabilitation management, the communities surrounding the opencast coal mines also received benefits from the mining authorities to the amount of £30 million over the five years up to 1989. These benefits were mostly in the form of roads, parks and recreation facilities.
Although the effect of environmental management is recognised in the United Kingdom, Baker (1996:46) is of the opinion that the conventions of management accounting, such as strategic management accounting, are still ineffective in providing information to management on the cost implications of their environmental decisions. The ultimate goal of the United Kingdom is the integration of environmental and economic criteria, which is known as environmental management accounting, into the national accounts. Ranganathan and Ditz (1996:40) emphasise the management accounting principle of better information on environmental costs that would inevitably lead to better decision making (Maher et al 1994:5). They, Ranganathan and Ditz (1996:40), suggest that the following elements of better management of environmental costs should be integrated into the existing management processes:

- information to decision-makers on environmental costs
- accountability of managers for costs they generate
- incorporation of environmental costs into management plans
- identification of other indicators of environmental costs
- integration of environmental cost accounting into all processes

The integration of these elements into existing environmental accounting procedures would increase the ability of management accountants as well as managers to make appropriate decisions.

The management of British Coal Opencast integrates mining operations, environmental control and the restoration of the mining site into a single process (Buchanan & Brenkley 1994:82). Environmental impact assessments are performed for every operation and are included in the integrated environmental management approach which is based on the following principles:

- The polluter pays, where the operator is held responsible for the full cost of compliance.
- Precautionary principle, where the operator demonstrates that there will be no environmental damage.
- BATNEEC (best available technique not entailing excessive costs), where the operator applies the best available technique not entailing excessive cost.
Communities and mining management realise the importance of finding a balance between environmental disturbances and the economic benefits of coal extraction. The local community of Barnsley, for instance, protested against the opening of an open-cast mine on the site of closed underground mines, knowing from past experiences about the disturbance caused by mining activities. British Coal agreed to lower limits on these disturbances and to extract the coal according to the principles of quality, quantity and market price (Bowhill 1989:535).

In this regard the British Geological Survey (BGS), an institute of the UK Natural Environment Research Council (NERC), serves as a neutral force in the economics-versus-environment debate, providing managers with relevant available information (Arthur 1995:36). From experience BGS argues, for example, against unrealistic environmental standards for the purity of emissions, as some toxic substances sometimes occur in nature at concentrations high above any that would be allowed during mining operations. This information institute does what a management accountant should do (Maher 1994:5), namely it combines all financial developmental and non-financial environmental data needed for decision making and supports managers in their efforts to find a balancing point. The BGS of the United Kingdom provides this expertise on a worldwide basis, especially in developing countries.

The United Kingdom is a leader when it comes to dust reduction measures. For developments in this field, and to encourage investments in rehabilitation management, the Queen's Award for Technological Achievement was awarded to British Coal for six years up to 1991 (Buchanan & Brenkley 1994:76).

Training of people in environmental rehabilitation is undertaken in the new unstructured and flexible organisation where people are unable to work unless they know what they are actually doing. There is a shift in the attitude of management, which is changing from seeing a company's people as assets, to managing them as a resource. People resources are assessed in the context of the culture, structure and processes of the company (Dalmahoy 1996:27). Since 1990 CIMA has been involved in initiatives to train and educate people in the management accounting profession on environmental cost issues, and this organisation is constantly developing new issues (Phillips 1992:97). To enable the accounting profession to take the lead in environmental issues such as environmental reporting, Ing (1992:292) suggests that measures such as the following be taken:
Professional institutes and associations should add environmental reporting to the syllabuses for professional examinations.

These associations should prepare minimum general standards, principles and guidelines for environmental reporting.

Accountants in practice should include environmental reporting in their individual education programmes and they should plan for adequate time to undertake these new responsibilities.

The aftercare aspects of rehabilitation management have indeed been recognised for more than a decade by managers in the mining industry in the United Kingdom. During the first years of reclamation grass and lucerne are being planted. When the soil has been stabilised after a few years, agricultural crops are introduced. Budgets must therefore make provision for a restoration fund to which the authorities also contribute. These land reclamation and aftercare procedures result in consistent successes in environmental and rehabilitation management systems in the United Kingdom (Bradshaw & Chadwick 1980: 180).

Budgets which make provision for restoration funds for aftercare form the focal point of strategic rehabilitation management. From the commencement of prospecting work to the day when a mine closes, financial provision should be made for aftercare and maintenance after closure. As the surrounding communities would also benefit from the utilisation of the rehabilitated land after closure, authorities should contribute a percentage of taxpayers’ money towards this fund for aftercare and post-closure maintenance.

For a few decades managers in the United Kingdom have been conscious of quality management issues. ISO9000 is based largely on the British standard BS 5750, which was first published in 1979. The BS 5750 was developed from the BS 5179, which has been a guide on standards for non-military quality systems since 1974. The International Organisation for Standardisation (ISO) initiated this international quality standard in 1983, and published ISO9000 in 1987 (Sadgrove 1994:20).

Environmental rehabilitation management in the United Kingdom largely satisfies the conditions of quality management as given by Juran (Schonberger & Knod 1994:29) of quality planning, quality control and quality improvement. The success the United
Kingdom has achieved in environmental rehabilitation management, making it a world leader, can be ascribed to the successful implementation of the goals of Russels’s (1990:18) quality management plan, which are

- the integration and promotion of quality management
- the development of organisations which are responsive to the needs and wants of the stakeholders, and the consistent provision of value to the stakeholders
- the achievement of continuous improvement

One of the bases for the success achieved in Britain is to be found in the advanced stage of development of management in general and in the mining industry in particular. Although the first three levels or generations of management may be found in different combinations in most successful operations (Joiner & Reynard 1994:8-10), these management systems in Britain may be between the third and the fourth generation of management. At the third level or generation, management functions by results obtained through independent delegation, and at the fourth level better results may be obtained through fundamental improvement by means of quality, a scientific approach and everyone functioning as a single team.

6.3.3 Measurement of and reporting on environmental rehabilitation efforts

In the United Kingdom management accountants and accountants realise that environmental care is becoming more costly and that they should be involved at an early stage in the calculation and reporting of rehabilitation efforts (Vann 1993: 22). In the past companies argued that since there are no requirements regarding the cleaning up of contaminated land, no adjustments should be made on the balance sheet. Managers have traditionally been trained to regard the natural environment as given. Historically the environment was treated as a free good, and the management accounting systems reflected environmental assets as such. Emphasis on corporate performance was normally in terms of profitability and efficiency for short-term decision-making purposes, but environmental pollution was not a measured variable. Ecology and the decrease of environmental pollution were not included in long-term management accounting strategies.

One of the major reasons why environmental pollution and the natural environment were
given low priority is the inclination to assess matters in financial terms only. Various models have been developed where both financial and non-financial indicators are applied to influence analyses of the life-cycle of operations (Evans 1996:49). By including both financial and non-financial information in the framework for decision making for the natural environment in respect of mining, a more accurate analysis of the whole strategic management approach can be obtained.

For the purposes of valuation of land a clause is now often added to the effect that the assumption is made that there is no contamination. By the time a financial report, which would include some environmental rehabilitation information, is published, the report is already out of date. But environmental issues are mostly concerned with the long-term management of resources for future decades or generations. Provision for cleanup costs is also frequently used although it would not be sufficient to return the land to its original natural state. As an example, British Coal provided £48 million in 1991/1992 for the rehabilitation of abandoned shafts and mine surfaces (Vann 1993:20). According to Cowe (1992:129) present environmental reporting does not satisfy information needs, because:

- Objectives are only reflected in the broadest terms and the measurement of resources is based on a combination of historical costs and valuations.
- No specific plans are revealed.
- Resources which are not involved in transactions are excluded.

Reporting of environmental matters by British companies is still committed to general environmental issues, emphasising the need to improve reporting. The reported information could often be positively misleading, being not directly related to the quality of environmental performance (Harte & Owen 1991:59; Healy 1991:8), or would only disclose the positive impact of environmental activities (Derwent 1989:94). According to a study by Robertson and Nicholson (1996:1104) on corporate social responsibility disclosures, which include environmental rehabilitation issues, there is more variability in internal communications than in external communications, emphasis on stakeholder groups varies in industry, and corporate rhetoric dominates the clear presentation of specific actions and plans.

The measurement of and reporting on environmental rehabilitation efforts should be encouraged, not only because stakeholders have to know what is done with their inputs
and natural surroundings, but also because the awareness of environmental investments and results reported on enhances existing positive environmental rehabilitation operations. But the danger of misrepresentation or misleading reported information should also be avoided. Watchdog organisations in the management accounting and auditing professions as well as among the public, should constantly take action to prevent the preparation of environmental reports only for the purpose of misleading advertising or window dressing.

Jones (1996:281) suggests in respect of reporting that a system of accounting for natural assets should be developed. In the first stage the habitats would be established and the level of inventory determined. These habitats would be valued in the next stage either at market value or at an amenity value together with an ecological grading. In the last stage all these results would be published in the annual reports in a summarised format.

Gray and Gray (1990:34,35) suggest that the accounting for environmental resources should be reconsidered. They propose that a definite distinction should be made between manmade and natural or environmental capital (see: Cowe 1992:131). In the case of natural capital management accountants should combine their skills, imagination and experience to find a means of measurement as monetary prices would be difficult to attach to these assets and might well not be adequate. Filsner and Cooper (1992:125) support the view that the accountant and management accountant face many challenges as well as opportunities, and that support for scientific assessments would often be needed from outside their field of expertise.

Van der Schroeff and Groeneveld (1984:114) from the Netherlands, on the other hand, distinguish between three relative functions of land in the process of placing a value on these assets. They are the functions of domicillium, of supplier of replaceable goods in vegetative production processes and supplier of irreplaceable goods in the extractive processes. All of them, in the reverse order of importance, are applicable when valuing mining land.

In the case of mining metals and minerals, these commodities cannot be returned to the land in the form of gold and coal. The value of the land decreases to a large extent because of the exhaustion of the irreplaceable extracted wealth. But the land can indeed be rehabilitated sufficiently in terms of adequately clean soil, water and air to be regarded
as a supplier of vegetative production in the agricultural and forestry business sectors. Quite large amounts sometimes need to be invested in order to prepare the land for agricultural production. Depending on the depth of current and previous mining activities, and the stability of the layers of soil and rock, the value of dwelling land should not necessarily be influenced drastically when acceptable rehabilitation programmes have been implemented. In the case of opencast and shallow mining operations the danger always exists of minor or major sinkholes occurring in weak areas.

Other leading United Kingdom experts realise that certain issues concerning the company’s environmental and rehabilitation policies are material to the financial statements. In this regard the British Institute of Management prepared a policy for management and the environment for consideration by all members (Lester 1992:46). Collison (1996:328) suggests in this regard that the following considerations should be included in financial reports:

- contingent liabilities on contaminated land caused by unauthorised spills and emissions, and provision for rehabilitation, abandonment and waste disposal commitments; and for insurance and legal costs
- reserves for unforeseen disasters
- valuation of fixed assets such as land and buildings, and a depreciation policy to incorporate the shorter life of assets under the BATNEEC (best available techniques not entailing excessive cost) system
- additional capital cost of productive assets needed to bring existing plant and equipment within the present required standards
- obsolete inventory and inventory costs owing to adapted environmental policies, including storage, disposal and recycling commitments

There are promising signs that both financial and non-financial information regarding environmental management is indeed disclosed in some of the financial statements and reports in the United Kingdom. The traditional view that a single indicator in monetary terms only gives management and the stakeholders a clear picture of how the enterprise is performing is being ignored. Resource and pollution flow accounts contain a combination of both monetary and non-monetary information. One of these groups of accounts is the environmental expenditure accounts which consist of capital and operating expenditures (Atkinson & Hamilton 1997:68).
Since managers increasingly require balanced information on both financial and operating matters to indicate how results were achieved, the balanced scorecard was developed (Kaplan & Norton 1992:72). Owing to the particular holistic characteristics of this management tool, it has many positive application possibilities for assessing rehabilitation management accounting policies. These include the simplicity which equips it to become the core of the management system (Brady 1993: 147), the focus on the impact of non-financial factors on long-term profitability (Newing 1995:23), its ability to motivate and drive the processes of change (Kaplan & Norton 1993:142) and to link long-term strategy with short-term actions (Kaplan & Norton 1996: 85), the approach of putting strategy and vision instead of control at the centre (Kaplan & Norton 1992: 79), and its ability to provide meaningful feedback on operations (Maisel 1992: 49).

The optimum combination of non-financial measurements in the disclosing documents, however, is limited to the goals of the organisation of efficiency in work performance, economy of resource utilisation, and effectiveness in terms of quality and quantity (Smith 1994:178,182). As the non-financial indicators are in the process of development and refinement, the management accountant should take care to select only those which are relevant to decision making. The application of non-financial indicators might over-emphasise the importance of operational details and might neglect the major strategy in which these operational goals are included (CIMA S4 P16 1996:181).

A survey of voluntary disclosures conducted by Jupe (1997:5-8) on corporate environmental reports of 1994/95 indicates that quite a variety of non-financial environmentally related information could be disclosed in annual reports (Figure 6.4). Although the environmental disclosures were informative, they are only provided by a minority of the big companies in the United Kingdom, and so yield little insight into actual impacts.
Figure 6.4 Financial and non-financial environmental information disclosed in published reports

<table>
<thead>
<tr>
<th>Items</th>
<th>(Number of disclosing companies: n = 25)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Financial</strong></td>
<td></td>
</tr>
<tr>
<td>Total expenditure on environment</td>
<td>7</td>
</tr>
<tr>
<td>Individual items of expenditure on environment</td>
<td>11</td>
</tr>
<tr>
<td><strong>Non-financial</strong></td>
<td></td>
</tr>
<tr>
<td>Discussion of environmental regulations/requirements</td>
<td>21</td>
</tr>
<tr>
<td>Specific environmental policies</td>
<td>25</td>
</tr>
<tr>
<td>Conservation of natural resources</td>
<td>15</td>
</tr>
<tr>
<td>Case studies of positive environmental practices</td>
<td>22</td>
</tr>
<tr>
<td>Environmental awards won</td>
<td>7</td>
</tr>
<tr>
<td>Environmental awards sponsored</td>
<td>7</td>
</tr>
<tr>
<td>Environmental training of staff</td>
<td>14</td>
</tr>
<tr>
<td>Recycling efforts</td>
<td>21</td>
</tr>
<tr>
<td>Reduction of harmful emissions</td>
<td>23</td>
</tr>
<tr>
<td>Environmental audit/impact assessment</td>
<td>15</td>
</tr>
<tr>
<td>Environmental office/committee</td>
<td>15</td>
</tr>
<tr>
<td>Waste reduction efforts</td>
<td>12</td>
</tr>
<tr>
<td>Support for community environmental projects</td>
<td>14</td>
</tr>
<tr>
<td>Prosecutions for environmental offences</td>
<td>10</td>
</tr>
<tr>
<td>Environmental targets set</td>
<td>15</td>
</tr>
<tr>
<td>Environmental performance measured against targets set</td>
<td>13</td>
</tr>
</tbody>
</table>

(Jupe 1997:6, adapted.)

By integrating financial and non-financial performance measures generated internally and externally, elements of quality management such as continuous improvement, benchmarking and customer-environmentalist partnerships are enhanced. A managerial form of accounting is developing with less emphasis on quantitative accounting and more on qualitative aspects. These new managerial themes form part of the system of accounting for strategic positioning as predicted by Kaplan about a decade ago (Roslender 1995:55). Although the role of the management accountant is expanding to include total quality management measures, care should be taken not to neglect the management accounting system. In New Zealand, for instance, Fowler (1996:54) found
that a significant number of management accountants involved in the implementation of total quality management did not modify and incorporate quality principles in their management accounting systems.

Most companies found that the exercise of regularly measuring their environmental activities for reporting purposes encouraged better environmental management policies. The Chartered Association of Certified Accountants of Britain holds an annual competition for the best environmental reports to support these developing environmental policies, and suggests that estimates of future environmental costs, as well as expenditure on rehabilitation as a percentage of sales, should also be disclosed (Cairncross 1995:207,208).

Managers, decision-makers and management accountants in the United Kingdom are increasingly realising that failure to take the cost of environmental damage into account is inefficient and is an obstacle to increased income and well-being for the mines internally as well as for the external community. Steer (1992:18) bears this out:

Without environmental policies, development will be undermined.
Without development, environmental protection will fail.

6.3.4 The role of the authorities

Environmental mining disasters are mostly due to uncontrolled and illegal mining operations. The role of the local and national authorities is to prevent such mishaps and to control these activities by means of laws and regulations. In the United Kingdom state regulations for coal mines date back to 1842 (Buchanan & Brenkley 1994:76), and for the prevention of pollution in rivers to 1876 (Cairncross 1995:90). These early regulations were introduced in response to disasters, but it was only in 1974 that this reactive cycle was effectively broken by the promulgation of the Health and Safety and Work Act (Cairncross 1995:42). In the opencast coal mining industry all production contracts now have to include 35 clauses dealing with the natural environment. Environmental assessments are carried out in advance and consultations with at least 20 different consultants are required (Whitworth 1989:69).

Management accountants should be informed about the extent and the details of the
action taken by local and central authorities regarding rehabilitation and environmental management. They should for example (Gray 1990:66) be able to

- deal with new taxation laws
- take other than traditional factors into consideration in the appraisal of investments and add cost aspects to new pollution control measures
- find alternatives to materials that damage the environment and consider recycling and rehabilitation procedures
- estimate the effect of environmentally conscious stakeholders on the authorities and the market

Common law does not provide for damage that has not yet occurred, but statutes could establish a system of permits and licences that could regulate mining activities that might cause pollution before the actual pollution occurs. Furthermore, common law cannot be applied where numerous polluters are involved (Cairncross 1995:90).

Provision is made for discharges from operating mines in England and Wales under the Water Act of 1989, which has been consolidated into the Water Resources Act of 1991 (Pentreath 1994:125). These provisions include conditions regarding the quality, quantity, discharge procedures and the monitoring of the water of the mine, and distinguish between underground and above-ground mining activities. After closure the owner has the option of cancelling these discharge permits. Similar practices for the discharge of polluted mine water during floods are found in South Africa. The regulation of these practices is still at the planning stage.

Other than in South Africa, local authorities in the United Kingdom have the power to acquire derelict land in order to return it to use in terms of the Town and Country Planning Act of 1944, and the National Parks and Access to the Countryside Act of 1949, amended in 1963 (Bradshaw & Chadwick 1980:22). Unsightly and abandoned land should be rehabilitated in terms of these Acts to improve its appearance and to bring it back to its original use, mostly as farmland. Other Acts and regulations pertaining to local authorities that are mentioned by these authors are:

- the Mines and Quarries (Tips) Act of 1969, which provides that disused dumps are not a danger to the public
• the Minerals Workings Act of 1951, which makes provision for the establishment of a fund for financing the rehabilitation of mined land and land adjoining mines
• the Town and Country Planning General Development Order of 1973, which requires the National Coal Board to submit a waste disposal and landscaping scheme aiming at the restoration of the mining site

In response to the European Community Directive 85/337/EEC of 1985, environmental assessment was given legal effect in the Town and Planning (Assessment of Environmental Effects) Regulation of 1988 (Buchanan & Brenkley 1994:75). In this regard British Coal has produced an assessment for every planning application for several years. The major environmental impacts which must be assessed are visual intrusion, dust control, noise, blasting, traffic and water affairs (Buchanan & Brenkley 1994:82). In this regard the UK Noise at Work Regulations were promulgated in 1989 (Buchanan & Brenkley 1994: 8). In South Africa similar impact assessments have been required by law since the promulgation of the Minerals Act 50 of 1991.

Conservation management within predetermined environmentally sensitive areas and on sites of specific scientific interest is encouraged by the authorities in Britain. Government authorities enter into formal agreements with the owners and occupiers of such areas to negotiate procedures and policies (Brotherton 1991:1183).

Environmental taxation reform is also a component of the role of the authorities in rehabilitation management, and is defined as “designed to create a framework of taxation which maximises the efficient use of resources and minimises pollution emissions” (Liberal Democrats 1993:3). The income generated from this tax should be reinvested in the economy in the form of compensation for those who are unable to adapt easily to higher standards. The aims of environmental taxation (Liberal Democrats 1993:6) would be
• to include the cost of damage to the natural environment caused by the product in the price that the consumer pays and which the producer receives
• to compensate for the inadequate provision for the depletion of non-renewable natural resources in the pricing procedure

Management accountants should make adequate financial provision for the changing attitudes of authorities, and should recognise and anticipate new trends. One of the aims
of the British Environmental Protection Act of 1990 was to discourage the gentlemanly approach of the government which had prevailed for more than a century in order to raise the standards of pollution control. Angus Smith (Cairncross 1995:56), who initiated the British pollution inspectorate in the middle of the nineteenth century, remarked in this regard

There are two modes of inspection. One is by a suspicious opponent, desirous of finding evil and ready to make the most of it. The other is that of a friendly adviser, who treats those whom he visits as gentlemen desirous of doing right.

6.3.5 Summary and conclusion

In the United Kingdom the mining industry is aware of the scientific principle that the extraction and processing of metals and minerals does not need to destroy and damage the environment and human health (Arthur 1995:37). Proper management and control combined with the application of the best available management accounting and other techniques would give the best rehabilitation management results. Where well-planned strip-mining and rehabilitation practices have been followed in the United Kingdom, it is almost impossible to tell where coal has previously been mined (Bradshaw & Chadwick 1980:163). The Opencast Executive holds a global record for the rehabilitation of sensitive environmental areas that are cost-beneficial even under the most difficult conditions.

Better environmental management policies in the mining sector are encouraged by the regular assessment of environmental activities for reporting purposes. Estimates for future rehabilitation costs as well as rehabilitation expenditure reflected as a percentages of sales should be disclosed so that they can be considered for the best annual report awards in the region.

The need for and lack of appropriate instruments for environmental management accounting, are still felt to a certain extent, however, and will be felt for some time to come. But mainly traditional attitudes and values, as well as the lack of appropriate knowledge and professional expertise, are obstacles in the way of these developments (Birkin 1996a:37).

In the United Kingdom the aim of environmental taxation reform by the authorities is
considered to be minimising pollution emissions and maximising the efficient use of natural resources. The taxation collected should be applied to compensate for the non-renewability of natural assets. The management accountants in this country are mostly aware of the fact that they should be familiar with new regulations and taxation laws. They realise that they need to be sensitive to all cost aspects arising from pollution control measures and to provide adequate and accurate information to environmentally conscious stakeholders.

The relatively successful implementation of rehabilitation management and the accompanying management accounting procedures in the mining industry in the United Kingdom is largely attributable to the high level of total quality environmental management achieved in this region.

In this regard South Africa could benefit by researching the management accounting methodologies applied in the United Kingdom. Since the composition of the populations and the climate of these two regions differ considerably, provision should also be made for adaptation to the local circumstances.
6.4 UNITED STATES OF AMERICA

Figure 6.5 United States of America

Since the first recorded mining operations for coal in 1730 in the South East in Virginia near Richmond, both the mining and consumption of coal have caused environmental damage in the United States of America (USA) (Grolier 1996). The cleaning up of these legacies in the mining industry requires the moving and treatment of extraordinarily large quantities of materials spread over large areas. An example is the more than 200 million cubic metres of mining waste materials stored in 3 500 hectares of tailings ponds in the Clark Fork area in Montana in the North West (Young 1992: 36). Approximately 3,3 billion tons of material (seven times the amount taken from the Panama Canal) were taken from the copper mine in the Bingham Canyon in Utah in the South West, leaving a hole 774 metres deep, making it the largest human excavation in the world (Young 1992:22). Abandoned sites like these which are extremely difficult to rehabilitate continue to pay negative dividends in the form of acid drainage, blocked rivers and contamination for centuries, unless the necessary remediation and cleanup procedures are implemented.
The management accountant should therefore be prepared to function in a milieu where environmental rehabilitation management systems need to accommodate policies aimed both at repairing past damage and at applying rehabilitation measures as part of an ongoing practice. On the other hand, shareholders and stakeholders are demanding more accountability from management structures. They want more funds to be invested in the prevention and diminution of pollution, as well as in cleaning up after operations, even if they have to forfeit dividends (Epstein & Pava 1992:32).

6.4.2 Environmental and rehabilitation management systems

Management of successful coal mining companies realise that environmental and rehabilitation management is an inescapable part of their business in a highly competitive industry, where oil prices are relatively low, and where they have to operate under the close scrutiny of regulatory authorities. As in any other area of planning, operating and marketing, these USA companies are continually seeking new ways to improve rehabilitation efficiency and to limit costs (Carter 1989:44). These elements of continuous improvement form an integral part of total quality management (Deming 1982:111), even when they are the result of a competitive market.

As enormous amounts are involved in environmental and rehabilitation management systems in the mining industry in the USA, efficient cost planning procedures in the long term as well as for the immediate future are necessary. It is estimated that it would cost the country between $32 billion and $71 billion to rehabilitate the 557 600 abandoned mines alone (Rosenbaum 1997:25). In 1993 (Ichniowski:7) these estimates for total mine rehabilitation were put at $71,5 billion. In the Sierra Nevada area in the South West, for example, $5 million was contributed to the cleanup of the 136 year old Penn Copper Mine where 330 000 cubic yards of mine waste are to be buried in a nine-acres landfill (Rosenbaum 1997:25). Since 1982 the Department of Energy invested $1,4 billion in a project involving the safe disposal of radioactive ore residues at abandoned plants (Kemezis 1991:23). According to estimates (Chironis 1987:58; Carter 1989:48), the coal mining industry spent more than $1 million per day on the treatments of acid mine water drainage, and such treatment is still continuing after mining has ended. In West Virginia in the South East 12 000 to 15 000 acres annually are rehabilitated on active coal mine sites and about 2 500 additional acres are rehabilitated on abandoned mine land which was unclaimed before 1977. In this state the mining industry has paid $300 million into
the fund for abandoned mine land since its establishment in 1977 (Coal 1990b:20).

When contamination is covered by insurance policies, the insurers need adequate information about how remediation technologies are applied, a cost framework for proposed rehabilitation, and documentation of total costs at comparable mining sites (Bowen & Lambe 1994:72). Costs might differ substantially from one site to another, such as from $25 to $50 per cubic yard for bioremediation, from $100 to $200 per cubic yard for liners, from $50 000 to $550 000 for laboratory and pilot studies, from $50 to $250 per cubic yard for stabilisation, from $50 000 to $1 million for feasibility studies, and from $30 to $130 per cubic yard for soil treatment. The insurers therefore want to obtain a thorough overview from the environmental management accountants and their teams of the various alternative choices, and their advantages and disadvantages, as well as of the parameters of the project, such as its duration and the determination of the stage when the contaminated area could be declared to be satisfactorily rehabilitated.

Although the mining industry might be in a decline, the cleanup and rehabilitation of defunct mines that are due to be closed is becoming big business. Over the next two decades an estimated amount of $1 trillion could be spent on 200 to 300 companies for rehabilitation services (Jones 1993:32). Twenty-two direct and indirect jobs are created for every $1 billion spent on the rehabilitation of abandoned mine land (Chemical Marketing Reporter 1993: 18). There are opportunities for gaining in the process of developing rehabilitation management instruments, such as compliance with a more cost-effective environmental strategy, and secondly by developing technology for the external market (Gertsch 1991:1306). The ideal situation, however, would be to plan for long-term rehabilitation measures while the mine is still operating, and to prevent large cash outflows at closure when the cash inflows are small.

However, the projection of what environmental rehabilitation projects might cost involves various external risk factors that should be dealt with. Project managers in the USA are often unable to estimate rehabilitation costs, or even average amounts. They easily underestimate from 30% to 50% of the budget (Daniels 1995:46). These contingencies, which comprise about 35% to 40% of the cost, result from regulatory changes, public involvements and possible litigation. For the management accountant this implies a reorientation from traditional cost accounting procedures to procedures which could include the investigation underlying causal variables, methods and techniques. The
convention of using historical data, for example, as the basis reduces the accuracy of rehabilitation budgets. In an effort to reduce contingencies on any rehabilitation project as much as possible, suitable goals, policies, procedures and responsibilities for the estimation of contingencies should be found. Contingency analysis requires that the management tasks of the project should be broken down, with the emphasis on high risk tasks. In this regard Wendel (1995:44) names the following factors that could affect contingency planning:

- changes in regulatory requirements, especially when dealing with more advanced rehabilitation projects, or with extraordinarily expensive schemes
- access agreements that may delay the scheduled reclamation activities, extensions to the review process required by the EPA or the public, and delays as a result of EPA final approval of current plans
- changes in rehabilitation contractors, with the result that time gets added to the schedule and fines for not keeping to the approved schedule
- new technology that might prove not to be acceptable and need to be replaced
- changes in assumptions such as the level of remediation or the number of samples required that may influence the initial cost estimates
- a combination of apparently minor incidents such as a series of relatively insignificant delays to the schedule which could result in a fine

The international set of standards governing environmental policy, ISO14000, describes a system of environmental policy, objectives, targets and programs for its implementation, monitoring and measurement, and for corrective action. A survey in the USA of executives in 115 large businesses revealed that 61% expected to meet ISO14000 specifications in order to gain a competitive advantage (Begley 1996:50). These international standards have the effect of reducing trade barriers, both for importing and for exporting, and could form the basis for environmental excellence. They have the potential to replace the traditional regulatory system of command and control.

The lending community has relied since 1988 on the World Bank Environmental Guidelines to determine environmental risks. The USA proposed Export-Import Bank Environmental Review Procedures with more detailed criteria for the quality of water, air, noise and for hazardous and toxic materials (Henderson 1995:50). This step is intended to encourage the application of voluntary international environmental
management standards, such as ISO14000, when providing funds.

In order to support financial and non-financial rehabilitation and environmental management procedures, several projects are being researched in the Northern Central States (Coal 1990a:11). Rehabilitation research areas are identified for both active and abandoned coal mines, and the results are sent to potential users in industry and at academic institutions and to the authorities. Increasing pressure to operate in a more cost-efficient manner brought governmental and industrial environmental rehabilitation parties together to share details about their respective projects and to pool information on rehabilitation cost management. Both private and public cost managers are accepting uniform approaches, and formulating standardised procedures for emergency situations and for long-term strategies (Rubin 1995:46). Slomp (1993:55) supports the view that the combined knowledge and experience of people from other professions, such as scientists, lawyers, engineers and financial accountants, would produce better environmental management results. These management policies of co-operation between various sectors in the economy and the forming of groups of cross-functional teams of experts coincide with point 9 of Deming’s (1982:17,35) 14 points of total quality management where he emphasises the importance of breaking down barriers between departments in an economic system.

Since the passage of the Surface Mining Control and Reclamation Act (SMCRA) of 1977, it has been a requirement that mined agricultural land should be returned to 100% of its original productivity (Sprouls 1990:52). In Ohio in the Middle Atlantic States, the Waterloo coal mine, for example, had about 700 head of cattle on rehabilitated land, the beginning of a secondary beef operation (Chironis 1982:63). This company first introduced fast cover plant materials to hold the soil and to retain moisture, such as wheat in autumn and oats in spring, followed by permanent grass species to finally prepare the land for further agricultural use. Mining companies demonstrate that mined land can indeed grow good crops and could be returned to beneficial agricultural use, but time will tell how rehabilitated farmland of this kind will yield in the long term.

Another example of the successful implementation of rehabilitation management following the SMCRA of 1977 is to be found in Colorado. A surface coal mine in this South Western State succeeded in achieving soil recovery and revegetation after experimenting, resulting in the improvement of wildlife habitat on reclaimed land (Carter
Next to the still operating draglines of the Trapper coal mine up to 500 elk could be spotted grazing on the revegetated land. The manager of Trapper is of the opinion that this successful conservation strategy requires an ongoing commitment of time and money, and that the results in terms of the reduction of soil loss and the potential savings in dollars follow a three-year rehabilitation program. Nieman and Merkin (1995:422) suggest in this regard that the potential to provide linkages between present wildlife habitats should be investigated, should coal mine rehabilitation sites be in the same region. The long-term post-mining rehabilitation planning framework should therefore make provision for the resettlement of fish and wildlife, according to regional policies.

Experts such as botanists could support the management accountant when calculating the costs and benefits of rehabilitation policies. In this regard it is estimated that the application of plants to reduce waste substances would eventually cost one-tenth of the amount that would have been invested in environmental engineers (Carey 1996:56). Plants such as Indian mustard are able to absorb metals, and the transgenic variety can transform a dangerous form of mercury into a less harmful one. Limitations to the applications of vegetation to purify soil and water, are the limited area that can be reached by the roots, and the danger that waste-absorbing plants could turn into hazardous waste themselves and become a danger to grazing animals. Wetland plants, such as cattails, remove metals from acid water in the coal mining industry by means of absorption, consumption and filtration (Public Utilities Fortnightly 1989:5). About ten years ago it cost approximately $10 000 to $15 000 to build such a wetland. In view of their low maintenance costs, these wetlands could pay for themselves within a few months (Chironis 1987:60). Symbiotic microbes and fungi provide essential organic material for the initial introduction of plant life, especially on iron-mine dumps where about two-thirds of the unearthed rock is dumped as waste (Cohen 1992:21). The cost of introducing fungi-treated trees such as pine, oak, fir, cedar and spruce on abandoned mine sites amounted to about $300 per acre, which was several thousand dollars less than the cost of the traditional resoiling processes (Wolf, Cordell & Keller 1982:64).

When comparing the costs and benefits of the long-term effects of revegetation with the costs and benefits of continuous engineering projects, revegetation obviously represents the better option in the USA. The long-term objectives of cost outlays for the establishment of revegetation (Johnson, Cooke & Stevensonl 1994:34) are
that the stability of the land surface would ensure that there is no surface erosion by water or wind
- the reduction of leaching into ground water and surface water to reduce releases of potentially toxic elements
- the development of a vegetated landscape or ecosystem which is in harmony with the surrounding environment
- the addition of some positive value to the aesthetic, productive or conservation environment

The Department of the Interior annually announces the names of winners of reclamation awards to encourage investment in sound rehabilitation management policies. Central Ohio Coal Company in the Middle Atlantic States, for instance, received the award for rehabilitation with recreation as the post-mining use (Coal 1992b:9). The company donated 9 000 hectares of reclaimed land on which coal had been mined as an international breeding centre for endangered animals. Other categories are for the rehabilitation of farmland, for reforestation, and for mountaintop mining (Coal 1991a:13). The winners are described not only as improving the land left behind, but also as leaving it in a better condition than before the commencement of mining operations. The Interstate Mining Compact Commission annually announces similar rehabilitation awards to mining operations in five coal and non-coal categories in which there were outstanding achievements (Coal 1991c:24).

Although the mining industry may be an easy target for environmental movements because of the high visibility of their past and present mistakes, mining in the USA should nevertheless change its relatively passive and reactionary attitude towards rehabilitation and environmental management systems (Gertsch 1991:1306). The major task of the environmental cost manager is to work towards a balance between the potential return from the enhanced applications of rehabilitated land, mostly in the long term, and the immediate expenditure in terms of resources, cost and time required to prepare permit applications and execute the eventual rehabilitation plan (Carter 1989:44). In this regard Orr (1994:59) quotes the World Commission on Environment and Development on the development required to achieve this balancing position:

... development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
6.4.3 Measurement of and reporting on environmental rehabilitation efforts

As early as 1970, Beams (657) realised that the accounting profession should introduce changes to accounting processes to include provision for the deterioration of industrial sites, and for the reestablishment of assets that were deteriorating as a result of pollution. Polluter companies undermined the comparability of the financial reports of major and minor contaminators by failing to account for the full cost of all resources consumed. Beams (1970:660) suggested that accountants should coordinate their efforts with those of industrial engineers, legal consultants and inspectors of the authorities to enable them to challenge the changing business environment. These words could have been written more than two decades later, and should have included management accountants as well.

The obvious degradation of the natural resources in most of the developing countries of the world is completely ignored in the 50-year-old framework of the United Nations System of National Accounts (SNA). Repetto (1992:64), a USA economist, emphasises that by failing to recognise the correct asset value of natural resources, the supporting accounting framework which provides the principle instruments for economic analyses misrepresents past policies and leads to inefficient future policies.

There are different approaches to the calculation of the full cost or true value of assets which can be applied to their environmental consumption. As early as 1967 Ijiri (97) defined the value of total assets as consisting of the value of the present assets together with the value of basic future positive assets minus the value of basic future negative assets, and defined income for a period as the difference between the value of assets at the end and at the beginning of the period. According to Repetto (1992:66) the value of an asset is not reflected in the investment cost, but in the present value of its income potential. He defines the true measure of depreciation as the “capitalized present value of the reduction in future income from an asset because of its decay or obsolescence”. The true definition of income includes sustainability “which meets the needs of the present generation without sacrificing the welfare of the future”, and in addition to current earnings also includes changes in the asset position. Smith (1994:16) emphasises the need to introduce the natural resource damage liability as an instrument to determine the natural resource damage assessment. This liability regards the natural environment as an asset that provides services to outside markets and to society.
Failure to adequately account for all the elements of rehabilitation policies, varying from successful efforts to failures, might lead to inefficient management decisions. The non-disclosure of the full range of rehabilitation results, in both monetary and non-monetary terms, to stakeholders would provide an incorrect reflection of their interests in the enterprise. The contribution of natural capital in the form of air, water and soil is not adequately recognised in industrial activities. These natural elements are lent for use and not provided for free consumption (Rubenstein 1992:29), and should be accounted for. In the pursuit of satisfactory profits the natural source of the profits could be damaged beyond repair. It is therefore necessary to determine the full cost and resultant profits which encompass both the internal and the external factors. Both the financial and non-financial elements need to be included when arriving at these assessments. All the various cycles and processes are aggregated in the value chain to reflect a complete view of full costs and true values.

Incorrect measurement criteria and methods of assessment could easily give the impression of prosperity while in fact the real situation is quite the opposite. Repetto (1992: 64) remarked in this regard that

A country can cut down its forests, erode its soils, pollute its aquifers and hunt its wildlife and fisheries to extinction, but its measured income is not affected as these assets disappear. Impoverishment is taken for progress.

In addition to the direct costs involved in determining rehabilitation budgets, estimated land reclamation costs should also include indirect costs such as opportunity costs, indirect effects of taxation, secondary equipment requirements, and royalties (Misiolek & Noser 1982:82). The choice of rehabilitation machinery and equipment influences the utilisation of its capacity, and has an indirect effect on the estimation of costs. The single largest cost item appears to be the removal and replacement of topsoil, constituting about 50% of the rehabilitation costs at a coal mine.

Freeman (1982:4) suggests that the benefits of pollution control could be measured either by comparing environmental quality levels with and without a specified degree of environmental control, or by comparing the actual quality levels for a year before the implementation of the policy with levels a year after its implementation. These benefits to individuals can be classified according to biological and nonliving systems, and the
economic effects of the benefits can be measured by means of the market and non-market (physical) channels to individuals (Figure 6.6).

**Figure 6.6  Measurement of benefits of pollution control**

<table>
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<tr>
<th>Effects on biological systems</th>
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<tbody>
<tr>
<td><strong>Market effects</strong></td>
<td><strong>Nonmarket effects</strong></td>
</tr>
<tr>
<td>Economic productivity:</td>
<td>Human health (years):Mortality</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Morbidity</td>
</tr>
<tr>
<td>Commercial fisheries</td>
<td>Human activities (hours, area):</td>
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<tr>
<td>Forestry</td>
<td>Sport fishing</td>
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<td></td>
<td>Hunting</td>
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<td>Wildlife observation</td>
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<td>Water-based recreation</td>
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<td>Home gardening</td>
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<td>Public landscaping</td>
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<td></td>
<td>Indirect human involvement:</td>
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<td></td>
<td>Species diversity(count)</td>
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<tr>
<td></td>
<td>Ecosystem stability</td>
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<table>
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<tr>
<th>Effects on nonliving systems</th>
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</thead>
<tbody>
<tr>
<td><strong>Market effects</strong></td>
<td><strong>Nonmarket effects</strong></td>
</tr>
<tr>
<td>Producers:</td>
<td>Households:</td>
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<tr>
<td>Damage to materials, corrosion</td>
<td>Damage to materials</td>
</tr>
<tr>
<td>Soiling</td>
<td>Soiling</td>
</tr>
<tr>
<td>Reduction in quality</td>
<td>Changes in weather, climate</td>
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<tr>
<td></td>
<td>Indirect effects:</td>
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<tr>
<td></td>
<td>Visibility</td>
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<td></td>
<td>Tranquillity</td>
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(Adapted from Freeman 1982: 9,10.)

The economic impacts of surface coal mine rehabilitation procedures were researched (Schlottmann & Spore 1976: 265) after the introduction of legislation in 1973 to control surface mining, particularly for coal. The authors found that the incremental production costs for adequate rehabilitation efforts were not excessively high, and that rehabilitation projects could be implemented in a cost-effective manner. Similar research in 1984
(Bishoff:170) revealed that, with proper initial planning postmining monetary deficiencies could be avoided. Through establishment of a surcharge on production for rehabilitation purposes, and the accurate maintenance of this complex cost issue in a model, reclamation standards and requirements could be reached, especially for new coal mining operations. These fixed and variable costs should be weighed against the economic losses of the temporary or permanent closure of the mining company as a result of environmental problems (Rosenblatt & Floyd 1992:24).

Roan and Martin (1996:186) developed a model in which production and rehabilitation costs are regarded as joint products in the mining process. The costs associated with particular environmental standards or requirements are estimated, in addition to the cost of policy changes. Changed or additional standards could be a barrier to the entry of new mines as more profitable ore should be processed to reach the same estimated profit levels. At existing mines the present profits could be reduced due to the changed additional environmental rehabilitation costs to be incurred, or as an alternative the life of the mine could be shortened.

In South Africa provision should be made in terms of the law (Act 50/1991 as amended) for future and current rehabilitation costs. Should the guidelines or standards for rehabilitation management change, these provisions would have to be adjusted. The result would be that profits as well as declared dividends would decrease, unless more profitable methods could be developed. New mines would have to make adequate provision for these additional standards from the time operations commenced. Other changes such as the introduction of labour recommendations from unions and central government could also influence decisions on the funding made available for rehabilitation projects.

Unlike in financial reporting, in environmental reports there are no strict rules on the information that must be published. Cairncross (1995:204) found that in the USA most environmental reports contain only quantitative data which are seldom verified by means of actual site inspections by experts and that the companies only disclose what they are obliged to mention. No indication of the relative reliability of the disclosed information is provided. Even when the disclosure of pollution-related information is required by law, as in the case of the involvement of an enterprise with rehabilitation programmes required by the Superfund, companies prefer not to disclose these data (Freedman & Stagliano
Illegal non-disclosures keep stakeholders in ignorance of activities that could influence future profits and the health of the community. Powerful business interests could exploit the masses, as in Vietnam when the workers were not informed about the potential health dangers of working in asbestos mines (Freedman & Stagliano 1995: 171). If mining enterprises are compelled to make projections of future rehabilitation costs, in the first instance the enterprises themselves would be informed about the financial implications of rehabilitation processes. When this information on rehabilitation is internally available, it could easily be disclosed to external stakeholders. In a democratic system stakeholders need to be informed in order to be able to make decisions and protect their rights. It is, however, necessary to enforce these environmental disclosures since laws do not work when they are not enforced.

Environmental disclosures in financial statements of companies could be measured either as the number of individual items or as a total. According to Patten (1992:473), total disclosures are measured as the number of pages included in the annual financial report, in 1/100th of a page. The number of sentences are also used, in Canada for instance, as a measure of disclosure of environmental performance in published statements (Buhr 1994:84). According to Patten an information item on the annual financial report should be regarded as an environmental disclosure when it could be related to one or more of the following subjects:

- environmental regulations or requirements or standards mentioned
- company environmental policies or company environmental concerns
- conservation of the natural environment or natural resources
- awards involved with environmental policies
- efforts to recycle
- expenditures and costs in connection with environmental activities
- litigation related to environmental procedures

Traditionally management accounting does not distinguish between different environmental costs. In order to achieve a distinction between the costs in this broad category of environmental costs, Ansari et al (1997b: MMEC-5) suggest that the various environmental activities should be identified. Each type of activity has its corresponding
environmental cost. They determined the following groups of activities:

- Prevention activities would eliminate potentially damaging environmental impacts. Prevention costs include the cost of redesigning to minimise the generation of hazardous waste materials at source.
- Assessment activities would measure and monitor potential causes of environmental damage. Examples of assessment costs are the monitoring of mercury levels at gold mines and the cost of environmental audits.
- Control activities have to control the damaging substances and waste products which are processed or produced. Control costs include costs incurred for the treatment of waste water, and for the safe disposal of waste products on dumps.
- Failure activities have to remedy accidental and careless damage to the environment. Failure costs are cleanup costs for past activities and for the treatment of contamination caused by present operations.

Freedman and Wasley (1990:191) investigated the association between environmental disclosures in financial reports and the actual environmental performance of enterprises in the USA. They found that these disclosures are not indicative of actual environmental performances, and suggest that these disclosures should be regulated and improved standards and requirements should be prepared. They emphasise that the disclosed environmental items should be meaningful and reliable to the potential stakeholders, as the potential users would incorporate this information in their decision-making models. This is related to one of the major functions of the management accountant, namely to provide appropriate information to help users make better decisions (Drury 1996:17).

Non-financial measures in management accounting such as quantity and quality have been known for many years (Ijiri 1967:101), but have not been directly applied in respect of environmental rehabilitation policies until recently. More recently, however, it was stated (Shevlin 1996:41) that financial accounting information to management and stakeholders is only value-relevant after the inclusion of non-financial information, and that variables for both non-financial and financial management accounting indicate incremental explanatory power when both are included in information models.

Cormier and Magnan (1997:235, 236) measured environmental performance using the actual pollution of water against the levels allowed by the authorities. They found that
enterprises' pollution control activities were negatively related to the market value, suggesting that the enterprises have environmental liabilities which are not accounted for in the balance sheet. Analyses and ratios based on relatively high incorrect figures in the financial statements which did not take environmental liabilities into account, could lead to wrong decisions and judgments. As the current financial statements do not adequately reflect environmental performance, Cormier and Magnan recommend that the following alternatives be considered by the setters of standards and requirements:

- The expanding of the section of the report dealing with management analyses of environmental issues should be considered. The section dealing with financial obligations should include a discussion of poor environmental performances which might require future resources to rectify the situation. Future cash outflows would be required to finance items such as fines, penalties, lawsuits and remedial action.
- The measurement criteria for environmental liabilities should be revised, in view of the existing uncertainty and freedom in their formulation. Proposed accounting standards on environmental liabilities in Canada (CICA 1995), the USA (FASB 1996) and the UK (ASB 1996) should be used as a basis. The most probable value should be disclosed with other valuations as a footnote.
- Auditing standards should be tightened in order to allow independent auditors to increase the consideration of environmental issues such as risks, the sources of risk, and the consequences of risks.

Although environmental management accountants are continuously becoming aware of the importance of arriving at more accurate ways to measure and report on environmental performance, much still needs to be done to improve on the current approaches. As in South Africa and in any other country which takes environmental rehabilitation management accounting and total quality management seriously, the principle of continuous improvement should constantly be applied (Deming 1982:30).

6.4.4 The role of the authorities

Management accountants in the mining industry should be informed about the attitude of the authorities in order to be able to make adequate provision for the treatment of waste and to rehabilitate according to set guidelines. At the Atlas Corporation, for
example, the company planned to bury radio-active mining waste materials on site on the bank of a river at an estimated cost of $13 million over three years. But the Nuclear Regulatory Commission insists that the only viable method would be to dispose of these wastes off the site, and at a cost of $100 million, which would take 10 to 12 years (Engineering News Report 1994:21).

The attitude and commitment to environmental protection in the USA has increased drastically during the past. The National Environmental Policy Act passed in 1969 was the earliest national measure in the world to give legal effect to environmental assessments (Buchanan & Brenkley 1994:75). The types of economic instruments that the authorities could apply to influence environmental management policies include charges and taxes, tradable permits, deposit-refund systems and subsidies (Barde 1997:225). In addition to these instruments about 30% of the land area of the USA owned by the national government consists of environmental reserves and is therefore not available for mining purposes (United Nations 1992: 10). Surface coal mine operators, for example, are unconditionally required by national laws to restore a mining site to a reasonable condition similar to the position before mining activities commenced (Sims 1994:703). In 1970 less than 1% of the gross domestic product (GDP) was devoted to environmentally related policies, in comparison with the estimated more than 2,5% of the GDP by the year 2000 (Rabe & Arbor 1996:372). Increasing trends such as these should be reckoned with by the management accountant when preparing long-term budgets for rehabilitation management purposes. As in South Africa, the evolution of regional, financial and taxation policies to promote the application of environmentally friendly rehabilitation technologies should be noted, and monetary and non-monetary projections for future developments should be made well in advance.

Authorities that impose restrictions on the use of land have the difficult task of finding a balance between the quality and quantity of preserved natural assets and on the delivery cost price of products such as coal. Theoretically, under a policy of complete rehabilitation, profits in the mining industry could be restricted extensively. With the introduction of the Federal Land Policy Management Act and other restrictions on the use of land, 27% of the minable surface coal in the country could not be processed at a profit (Watson 1996:126). When natural preservation restrictions were relaxed to a certain extent in an effort to minimise rehabilitation costs, coal could be delivered on the national and international markets at competitive prices with “minimal” impact on the natural
assets. On the other hand, protection measures of this nature in the coal mining sector undoubtedly do environmental damage, and allow management policies to be less efficient than they would have been without subsidies from the authorities.

In an effort to consolidate responsibility for environmental rehabilitation and remediation, and to centralise the national management system, the US Department of Energy (DOE) established the Office of Environmental Restoration and Waste Management (EM) in 1989 (Jackson, Gillette, Goldberg & Hooper 1994:29). A similar project was launched in South Africa, but final comprehensive legislative measures had not yet been agreed upon. Parties interested in the DOE decision-making processes in the USA made contributions during both the design and the execution phases of the programme. EM developed the long-term and billion-dollar programmes and management structures for this complex project. But this scheme later evolved towards the next phase of effectiveness and efficiency, which includes cost improvements. For the cost improvement initiatives, benchmarking was applied to determine cost issues such as programme classification, a nationwide cost improvement survey, paired cost comparisons and component benchmarking.

A series of statutes is enacted in the country to protect water, soil, air and wildlife. The laws are mostly not aimed at particular industries such as the mining industry, but are directed in general to the protection of human health and of ecological concerns. In order to construct and operate a mine, the company needs to obtain a series of permits from the various authorities (United Nations 1992: 11,12), such as the following:

- a permit under the Clean Air Act to limit the emission of pollutants into the atmosphere
- a permit under the Clean Water Act to appropriately treat discharges into rivers
- a permit under the Resource Conservation and Recovery Act to ensure that solid waste materials are managed in an environmentally acceptable manner
- a permit under the National Environmental Policy Act to prepare an environmental impact statement in respect of operations that would significantly influence the quality of human living environments

Under the Surface Mining Control and Reclamation Act (SMCRA) of 1977, administered nationally by the Office of Surface Mining, coal mining states have primary responsibility
for the rehabilitation activities on abandoned and operating surface mines. In order to upgrade and improve this program for surface coal mine rehabilitation, West Virginia in the South East, for example, had to add $4.7 million in 1991 to its annual budget for the employment of inspectors and supporting personnel (Coal 1991b:15).

On the other hand, some laws such as the Mining Law of 1872, are still in operation, although they permit the mining approaches of “take the minerals and run”, leaving a contaminated legacy for the taxpayer to rehabilitate (Chemical Marketing Reporter 1993:18). The mining industry as well as the commercial industry urge much needed changes to this ineffective legislation of 1872 (Warner 1993:50). Authorities also need a system of continuous improvement, which is included in total quality management, to ensure the successful execution of their programmes.

The Abandoned Mine Land (AML) reclamation programme was established as part of SMCRA in 1977 with the aim of rehabilitating abandoned mine areas where the original mining companies and operators were not able to perform these activities. Federal auditors estimated that less than 2% of these abandoned sites in the coal mining sector, at a total estimated reclamation cost of $60.8 billion, had been rehabilitated since 1977 (Coal 1992a:11). The AML reclamation fund obtains its income from fees and charges on mined coal, amounting to about $2.3 billion from 30 states, and allocations of about $2 billion have been made to 35 states (Coal 1989:9). These appropriations increased to $3 billion by 1993 (Chemical Marketing Reporter 1993:18). Huge amounts are involved in the rehabilitation of abandoned mine sites such as the $100 million needed for a company that went bankrupt in 1993 after a century of mining and processing that contaminated the Silver Valley in Idaho in the North West (Steubner 1995:36-37).

Management accountants should have a knowledge of the enormous amounts involved and the many years needed to rehabilitate abandoned and active mining sites. They form part of the team of experts who know to what extent these rehabilitation costs are deductible for taxation purposes.

Rehabilitation and taxation issues might occur (Panock 1994:71) when

- the taxpayer is advised by the national, state or local authorities or the EPA that the mining site will have to be rehabilitated or restored
rehabilitation is part of the normal activities of the enterprise
the property is acquired
investigations indicate that possible contamination occurred before the acquisition of the asset

The treatment of expenses, such as surface mining rehabilitation for taxation purposes, given in sections 468 and 468A of the Internal Revenue Code (Sims 1994:703), is based on the principle that costs are deductible when they are regarded as ordinary business expenses. Expenses that are capitalised are not deductible. The Internal Revenue Service (IRS) stated that the following conditions (Emory, Swenson, Lerner & Fuller 1993:125; Gibby & Patella 1993:44) should be met in order for remediation costs to be currently deductible:

- The expenditure on the environmental repair should be incidental.
- The cost of the remediation should not materially add to the value of the property.
- The expenditure on the repair should not appreciably prolong the useful life of the property.
- The purpose of the expenditure is to keep the property in ordinarily efficient operating condition.

These conditions for the deductibility of remediation costs in the USA are not satisfactory. Contrary to the suggestion that environmental repair should cost a minor amount and be of minor importance, remediation activities should be regarded as being of the utmost importance. The second condition implies that remediation should be so limited as not to add value to the property, but any remediation pertaining to air, water and soil would indeed increase the value of damaged property. In contrast to the view expressed in the third condition, the objective of repair to the environment is to prolong the useful life of the property, if not for mining, then for other purposes, in accordance with the fourth condition.

In TAM 9315004 the IRS ruled that the costs of environmental rehabilitation operations are capital expenditures. These expenditures include costs incurred for assessment, remediation, transportation, disposition of contaminated soil and the cost of newly acquired soil (Emory et al 1993:125). When expenses such as environmental audit costs and research and development expenses could be regarded as part of the environmental
rehabilitation plan, these expenses should be capitalised, but legal fees paid to defend the company are deductible in the year in which they are incurred (Gibby & Patella 1993:46). Rev. Rul. 94-38 (Langstraat & Harrast, 1995:325; Witner & Lynch 1995:274) state that the costs of the rehabilitation of land and the treatment of ground water are deductible if no permanent improvements to the land have been produced. These costs include the cost of soil removal, backfilling, monitoring and remediation of ground water. The costs of the construction of the facilities for treating the contaminated water are non-deductible capital expenditures. To be deductible the expenditure should return the property to the state it was in before the commencement of operations, and it should not make the property more valuable, usable, increase its capacity, enhance the safety or efficiency, or extend its productive time (Weld & Price 1997: 221; Sharp 1992:55).

The return of the property to the state it was in before the commencement of mining operations would mean that the extracted gold, coal and other valuable commodities would have to be put back into the soil. The real value of the land would be less after mining activities ceased owing to the potential non-profitable extraction of what is left. It is impossible to actually comply with these rules for the deductibility of repair costs, and they should be redefined to encourage rehabilitation projects.

In the case of post-acquisition rehabilitation expenses, those payments are capital expenses regardless of what they would have been if the previous owner had had to incur these expenses (Lipton 1996:77). The contingent liability included in the purchase price was part of the cost price of the assets acquired (Fox & Solomon 1992: 15). It might be a better policy for the buyer to negotiate with the seller to adjust the purchase price, and let the seller pay the rehabilitation expenses. The seller is in a position to deduct these costs for taxation purposes, or add them to the original price of the property. The buyer could avoid future disputes with the IRS and may recover the additional costs through depreciation if the asset is depreciable (Megaard & Megaard 1994:203).

Sims (1994:703) argues that the interpretation of the moment of deductibility is not clearly stated in the laws. Either the deduction might be allowed when the rehabilitation costs are actually paid, or the discounted entire future amount might be allowed immediately. The management accountant is aware that this would clearly reflect different profit figures in the financial reports and would influence present and future cash flow budgets. Deductions which are allowed when the rehabilitation expenses are
paid would lead to lower cash outflow provisions in the particular taxation year when the costs are incurred. On the other hand, deductions allowed on discounted entire future amounts would immediately reduce cash outflow provisions for taxation purposes.

In the USA the taxation issues on environmental rehabilitation still contain several inconsistencies and the IRS pronouncements conflict with each other and with those of judicial authorities (Witner & Lynch 1995: 268, 273). These conflicting measures contribute to the present unfavourable taxation attitude of the authorities towards most environmental rehabilitation cost categories, and discourage the incentives to mining companies to voluntarily undertake reclamation projects unless they are legally required to do so.

The contribution of the mining sector towards the economy of the country includes direct employment to 120 000 workers in hard-rock (excluding coal) mining, about $32 billion to the national economy, and $117 million in taxation from the copper industry alone (Warner 1993:50). The authorities are therefore directly and indirectly involved in the processes of economically and technologically rehabilitating mining areas.

In comparison with the nonmining industries, industries drawing up land usage plans for mining purposes were the first to be compelled by law to present environmental impact studies. Approximately 700 square kilometres of land were stripped annually for urban construction purposes, and for every kilometre of a two-lane highway 35 acres of land were cleared (Brookins 1981:154) without the environmental impact assessments required by law.

The importance of cooperation between authorities and environmental management accountants is emphasised by McGinley (1992:267):

...unregulated coal mining in a free market economy can cause extremely serious environmental harm with attendant adverse social and economic impacts which cannot be effectively resolved without comprehensive and strict government regulation.

6.4.5 Summary and conclusion

Total quality environmental management in the mining industry in the USA is at a more
advanced level than in South Africa, although South Africa may apply more sophisticated systems in exceptionable situations. As in South Africa, both private and public rehabilitation policies must coincide with policies for repairing past contamination of the natural environment and for providing for rehabilitation as an ongoing function of the enterprise.

The functions of the management accountant of gathering, reporting and analysing cost data for decision-making purposes, and the interpretation and reporting of results (Rayburn 1986:12), are present at differing degrees in the USA in respect of environmental management accounting. Although illegal non-disclosures are found, there is a trend in the direction of accounting for the full cost of all natural resources used and consumed. These functions are encouraged by insurance companies in the USA which require precise cost frameworks for proposed rehabilitation projects as well as projections of total costs in respect of the mining companies themselves and comparable mining enterprises.

Various management accounting theories and models for determining the value and cost of natural resources have been developed and implemented. These models devise ways and means of assessing and determining both financial and non-financial effects of pollution management for introduction into the mining industry.

As the commitment to environmental protection in the USA has increased during the past decades, more nation-wide measures are now encouraged by means of legislation. The management accountants who are part of a team of experts, are informed about the latest legislative developments, about possible future promulgations by the authorities, and about the financial implications for the mining industry. To be deductible for taxation purposes, rehabilitation expenses should return the property to the state it was in before the commencement of mining operations, and should not make the property more valuable, usable, increase its capacity, enhance safety or efficiency, or extend its productive life.

An effort was made by the Department of Energy to consolidate environmental responsibilities under a single centralised national management system. Although consensus exists in South Africa that a similar centralised body should be formed, final comprehensive legislation has not yet been agreed upon. In the USA governmental and
industrial environmental groups are brought together as a result of increasing pressure to operate in a more cost-efficient manner. They now share information about their respective projects and the costs involved in this benchmarking process. This emphasises the importance of the management accountant being part of a managerial team undertaking rehabilitation management.

New prospects are, however, developing as the reclamation and rehabilitation of non-profitable mines due to be closed, are becoming prosperous projects. There is an awareness that contingency planning should be included as part of the strategic management system developed by the management accountant.

By researching the various rehabilitation approaches of the USA mining enterprises and the underlying reasons for success or failure, the South African management accountant could obtain non-financial benefits in the form of the diminishing of years which would have been allowed for the local evolvement of processes, as well as financial benefits.

6.5 SUMMARY AND CONCLUSION

6.5.1 Introduction

Rehabilitation management policies, together with the accompanying management accounting procedures for rehabilitation strategies in the mining industry, are investigated in this chapter. Canada, the United Kingdom and the United States of America which are among the developed regions of the world which have the highest ratings, were the target countries for this investigation. To assist management accountants to form a more complete picture of the origin and characteristics of rehabilitation costs and expenses, environmental and rehabilitation management systems were investigated, as were the measurement of and reporting on environmental rehabilitation efforts and the role of the relevant authorities. South African management accountants involved in environmental rehabilitation could benefit greatly by researching these aspects of rehabilitation costs in some of the most advanced developed countries in the world.

6.5.2 Environmental and rehabilitation management systems

More advanced environmental and rehabilitation management systems are found in the
mining industry in developed countries such as Canada, the United Kingdom and the United States of America than in the developing countries of most of Africa. The result is that it has been possible to develop environmental accounting and management accounting theories and models in these leading countries. This could be attributed to the fact that better information on rehabilitation and environmental costs inevitably leads to better decision making.

Developed countries tend to direct their financial, non-financial and natural resources towards the development of technology and productivity for the rehabilitation of the natural environment. Their major aim is to restore the environment to the same state or a better state than before the mines started operating, in accordance with the broad principles of total quality management. For this purpose the environmental performance scorecard of Epstein (1996:235) was developed to compare financial and non-financial efforts with matching results in the natural environment. In order to achieve this objective, the tendency in the developed countries is to allow people to work under conditions similar to those that apply with the third and fourth generations of management as defined by Joiner and Reynard (1994:9). In Africa, on the other hand, a top-down management system such as the first and second generations of management of Joiner and Reynard gives better results.

Various commendable aspects of environmental and rehabilitation management systems are found in these developed regions. Environmental rehabilitation policy issues that South African management accountants should increasingly include in their preparation of cost information strategies for decision making, are:

- the possible use of extended revegetation projects which might be more cost-beneficial than existing engineering programmes
- the influence of rewards for outstanding rehabilitation management operations to encourage disclosure of rehabilitation expenses
- international pressure to comply with ISO9000 and ISO14000 recommended international standards before sanctions are imposed on local industries
- the preparation of longer term planning schedules and budgets to make provision for rehabilitation and closure projects
- constant investments in environmental training and education for all people of all ranks involved in mining activities, varying from internal programmes to external
symposia
- benchmarking between similar groups as well as with authorities in order to determine best practices
- recoveries from rehabilitation projects in terms of income from scrap metal and gold from dumps
- adequate provision for research and development programmes on rehabilitation issues which might reduce future costs
- emphasis on precautionary and preventive costs
- continuing after-closure expenses such as expenditure on water treatment facilities
- the involvement of multi-disciplinary teams of experts to enable better decisions to be made on the application of funds for rehabilitation purposes
- international tendencies to tighten environmental auditing standards

Canada, the United Kingdom and the USA have the necessary experience and resources to draw on. South Africa, on the other hand, has a leading role to play in Africa, and should also take care not to repeat the failures with environmental and rehabilitation management policies experienced in African countries.

6.5.3 The measurement of and reporting on environmental rehabilitation efforts

In both developed and developing countries environmental rehabilitation management projects in the mining industry are extremely costly in relation to the per capita income of the populations. It is therefore necessary for the management accountant to accurately determine the financial and non-financial implications of environmental rehabilitation operations, from both the cost and the benefit angles.

These developed countries formulated a large number of frameworks and models for assessing rehabilitation efforts. In Canada, for example, criteria have been laid down for dealing with future negative environmental effects; rehabilitation costs are calculated as between 3 and 20 percent of net income, and the whole process of calculating life cycle costs is included in assessments. CICA (The Canadian Institute of Chartered Accountants) plays a major part in working out these detailed frameworks. In the United Kingdom, for instance, models for accounting for natural assets have been developed.

In general, reporting on environmental rehabilitation expenditure is not adequate in either
developed or developing countries, although the developed countries are in the leading position. The following deductions could be made in respect of attitudes in these three countries:

- As there are no strict rules compelling mining companies to disclose rehabilitation activities, comparable information for different companies is not readily available.
- There is a realisation that the measurement of and reporting on rehabilitation efforts should include a wide spectrum of indicators and instruments.
- Financial as well as non-financial methods are increasingly applied in order to value environmental assets and liabilities and assess benefits.
- There is a growing awareness that adequate financial provision needs to be made for future contingencies and long-term rehabilitation and maintenance operations.
- People in developed countries are conscious of the fact that an ecobalance should be the aim of reported inflows and outflows of resources, materials, energy and waste. The amounts invested in rehabilitation are compared with the environmental results of these rehabilitation projects.
- Regular assessments of environmental and rehabilitation activities for reporting purposes encourage better environmental management policies.
- Provision in cash budgets for future rehabilitation and closure costs forms an integral part of strategic planning.

The South African management accountant could only benefit by being aware of developments in these countries regarding the measurement of and reporting on rehabilitation management efforts.

6.5.4 The role of the authorities

As in South Africa, management accountants and policy-makers in these countries have to rely on rehabilitation legislation measures which vary from Acts governing clean water, clean air and noise abatement to legislation on labour and health, apart from specific laws applicable to mines and abandoned mines. In developed countries such as Canada, the United Kingdom and the United States of America, more sophisticated systems of laws, taxation, regulations, guidelines and law-enforcement procedures are found than in most of developing Africa.
The following tendencies were noticed in these developed regions which might influence future decision making by local management accountants:

- The developed countries are still in the process of improving and consolidating their legislative measures concerning the rehabilitation of mining sites.
- In most instances public awareness and concern in these developed countries have a positive influence on the evolution of legislation, regulations and guidelines.
- Authorities are very much concerned about rehabilitation management, and more lenient deduction allowances in respect of taxation might be promulgated in the near future.

Since environmental management accountants in South Africa already know about the existing cost implications of the policies of local and national authorities, as well as of possible future attitudes, trends in developed countries should also be noted. Future pressure from these countries on South Africa concerning trade agreements with prescribed environmental and rehabilitation conditions similar to their own policies could then be avoided. In most instances it would be more beneficial to invest at an earlier stage in acceptable environmental protective projects than to postpone these investments until the mining industry is faced with boycott actions.

An awareness of the future implications of present mining practices for the world economy has been detected by leaders in the field of management. The total costs of the mining of metals and minerals to the environment and to society have not yet been determined, as "new" cost items constantly seem to appear on the horizon. As the low-cost but limited resources of copper and other scarce metals and minerals become exhausted over the next centuries, for example, the global economy might gradually become dependent on iron and aluminium only. This would cause a transition to the preindustrial standard of living of the New Iron Age (Gordon, Koopmans, Nordhaus & Skinner 1987:156), unless severe preventive measures are taken well in advance by authorities.

6.5.5 Conclusion

Although some of the most advanced of the developed countries such as Canada, the United Kingdom and the United States of America compare favourably to the developing
countries of Africa, their management accountants realise the importance of continuously improving the present systems of environmental and rehabilitation management, the measurement of and reporting on environmental rehabilitation efforts and the encouragement and expansion of the positive involvement of the authorities. These developed countries provide conditional financial and technical support for the rehabilitation of mine sites in the developing countries, but they do not adapt their traditional attitudes in the process. In principle the developed component of the South African community should also continue to improve on the existing environmental rehabilitation management policies without compensating for surrounding negative influences. More emphasis needs to be placed on the positive influence and experience of the developed countries.

South Africa could make a positive contribution towards Gore’s “Global Marshall Plan” ideology (1992:295) as applied in environmental rehabilitation management in the mining sector. Determining both the strong and the weak points of environmental rehabilitation policies in the rest of the world which are applicable to the local management accountants would make it possible to improve South African attitudes. The relatively advanced methods and approaches of the developed countries such as Canada, the United Kingdom and the United States of America could be adapted for the local situation and population groups. As South Africa has development stages coinciding with those of both the developed and the developing countries, and is situated in Africa, the relative successes of the continent as well as the failures should definitely not be ignored. It is therefore of the utmost importance that the South African management accountant should be part of a team of experts that could find the most suitable set of solutions for the rehabilitation management problems facing South Africa. This solution should accommodate all interested and affected groups, including the natural environment and future generations.

In this complex milieu of developed and developing forces, South African environmental management accountants should continue to perform the basic function of the provision of information for decision making (Maher et al. 1994:4), taking the emerging aspects of total quality environmental management into account. Bearing all these management accounting elements in mind, they should be able to develop both general and unique strategies and models to accommodate the particular circumstances of each individual rehabilitation project.