



The socio-economic aspects of mine closure and sustainable development: literature overview and lessons for the socio-economic aspects of closure—Report 1

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Rationale for the study

This study was undertaken to generate a locally relevant guideline for the socio-economic aspects of mine closure for South African closure practitioners and decision makers. It should also represent a resource for interested and involved stakeholders.

Mine closure, and its related post-closure social, environmental and economic characteristics, is part of the lifecycle of mining operations, given the finite nature of the ore resource. Many coal mines are anticipated to close in the next ten to fifteen years in Mpumalanga, as the epicentre of the industry shifts towards the Waterberg. Social aspects of mine closure have been historically underplayed, and underresearched.

Coaltech thus commissioned two studies, the first of which examined the closure dynamics of 36 mines in Mpumalanga and KwaZulu-Natal in 2006. A follow-up study (July 2007) focusing on Mpumalanga^{3,4} confirmed some of the results of the first study. It also contained broad guidelines for mine closure covering social and labour planning, job creation, the use of mine infrastructure, developmental incentives, and environmental rehabilitation.

Both projects cited problematic social aspects of closure such as confusion in the management of social (as opposed to environmental, engineering, or other physical) risks; inappropriate training for self-employment; the failure of job creation schemes; the illegal occupation of houses; and vandalism of infrastructure and facilities.

Coaltech subsequently commissioned the Centre for Sustainability in Mining and Industry (CSMI) at the University of the Witwatersrand to undertake a third study to generate a locally relevant guideline for closure, taking into account local and global developments in the field, including existing closure toolkits.

Mine closure in the context of developing countries differs from that which occurs in developed countries, in that alternative socio-economic and environmental options are limited in the former. Yet building the foundations for sustainable local economic development is a pressing concern in developing countries requiring creativity, co-operation and leadership. Direct government subsidization

has been used in mitigation (e.g. Zambia copperbelt), as has the development of alternative commercial, industrial, or administrative activities (Selebi Phikwe, Botswana).

Mine closure in South Africa has to contend with a unique scale and diversity of mining and socio-economic contexts, as far as the apartheid legacy continues in the settlement patterns, inconsistent legislation in relation to responsibilities, capacitation levels, and ability for various stakeholder groups to engage and contribute to solutions. The broad legislative requirements are insufficient to provide guidance for the case by case subtleties of the context within which the closure must occur. The demands and nuances of the specific situations are worked out, or overlooked, by the stakeholders themselves.

Closure problems encountered include mis-communication over a number of issues, such as community expectations, the ability for the company to deliver on these, company plans, government policy and expectations, as well as the psychological stressors on all individuals and groups relating to closure. Company-community relations, governments, and non-governmental organizations are therefore critical in determining closure outcomes.

The research undertaken to support the guideline analyses international and local experiences of closure, with a view to providing South African practitioners and decision makers with guidance on enhancing the management of the social and economic aspects of closure.

The guideline, provided in a separate Report, focuses on the social context of mine closure; the subject is complex and high risk, requires engagement over years, delivers few quick wins, and requires cooperation and understanding between internally and externally heterogeneous groups of people. Closure requirements in relation to host communities are a special focus area. Logically, closure does not take place in a social, economic, or environmental vacuum, and this guideline is therefore framed within the requirements understood for sustainable development.

¹Report 2 of 2 contains the Guidelines for socio-economic aspects for closure, developed from this report as its base.

²Commissioned by the Mpumalanga Department of Economic Development and Planning in 2007.

³The Revitalisation Strategy for Dying Mining Towns within Mpumalanga, otherwise known as the 'Laduma Study'.

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Scope of work and approach

The focus of the study has been to identify and address shortfalls in the management of the social aspects of closure in South Africa, with a view to providing a pragmatic social process guide for use by closure practitioners.

As an initial step, the key principles for mine closure contained in the local and international literature were examined, in order to extract generic principles for stakeholder behaviour related to closure. Environmental issues are presented only in as far as they contribute to socio-economic stability and/or development. The relationship between stakeholders, especially host communities and the mining corporations, lie at the heart of the problems currently encountered in implementing sustainable closure.

Following this, two South African coal mines destined for closure in the short term, in the last stages of operational life, or where closure had recently taken place, were investigated. The case studies undertaken to this end involved a mine in a major coal mining region which was closed in 2002 and subsequently reopened, and another in a remote part of the country which is destined for closure in 2014. A third case study was intended at the start of this project; however, investigation thereafter proved this to be unfeasible.

Both the international and local information was then assessed, and through the use of leading-edge sociological theories, guidance for closure was developed for local, pragmatic application. This guidance includes issues such as stakeholder capacitation, engagement, and partnering, with the ultimate aim of leaving communities with opportunities to perpetuate their existence, with the necessary responsibilities of all stakeholders known, understood, and agreed to.

The background information provided in the literature review is not intended to be exhaustive, but rather indicative of the crucial social closure principles unearthed in the assessment.

Literature review: mine closure and best practice

Closure processes are multi-contextual; while South African coal-mining has a number of indigenous historical, cultural, and social factors distinguishing it from mining in other parts of the world, certain generic approaches have application. There is simultaneously a paucity of research into the management of socio-economic risk relating to closure compared to that on environmental rehabilitation.

In terms of host communities specifically, dependencies for employment, services, and markets for local businesses—especially in developing or underdeveloped countries—create challenges at mine closure to leave behind communities that enjoy some developmental opportunities after the end of the operational portion of mine life. Degraded natural environments also present significant challenges affecting the quality of life and subsistence livelihoods of community members.

The policy context relating to mine closure is changing: the abandonment of mines is no longer permitted; new legislative regimes demand that mines take responsibility for labour-sending and host communities; and there is a growing ethic that mines should leave behind decommissioned

infrastructure and sustainable economic arrangements that do not curtail opportunities for communities to function once a mine has gone.

Best practice in mine closure must seek alignment in (i) policy implementation, (ii) stakeholder expectations, and (iii) realising developmental goals.

Definitions and scope of mine closure

A mine is closed when the designated government authority grants a certificate absolving the owner/operator of the mine from any further requirement to operate the mine, and for all liabilities and responsibilities related to the social, environmental and economic impacts of the mine.

Mine closure is, however, a process, not a discrete event, and best practice requires that closure planning start at the inception of mine feasibility. This 'design for closure' involves cost-effective action by all stakeholders to promote sustainable development on an integrated basis customized to the social, economic, and environmental requirements of each non-operational, orphaned, or abandoned mining site. In this way, appropriate closure can result in mines becoming engines for development beyond their own life through a process that minimizes adverse impacts and maximizes after-use benefits in the long-term (Post Mining Alliance, 2005).

Planned and unplanned closures (due to factors external to the operation itself) require different application of closure processes.

Effective mine closure involves multiple interrelated concepts, across the social, environmental, and economic spheres of development:

- Despite generic principles, there is no 'one size fits all' and social, environmental, and economic site specifics must be taken into account in the closure process design, and goal setting (Environmental Protection Agency, 1995)
- Closure involves integrating the interests and agendas of all key role players, which encapsulates the requirement for contemporary notions of consultation (a multi-way exchange of ideas, not a one-way provision of information or intent)
- Final land use planning must evolve throughout the life of the mine, and needs to be reviewed to fit within developmental, ecological, social, and political imperatives as these change
- Planning for mine closure must include current and future health, safety, environment, community, and business risks (Goodyear, 2006) and opportunities, as understood at any one time
- Ultimately, integrated closure involves or requires inventive biological and engineering solutions, creative financial mechanisms to release diverse sources of funds, new legislative instruments to remove regulatory redundancies, benchmark research, best practice demonstration modelling, and regeneration partnerships across the lines between the governmental, private and non-governmental sectors and, by no means least, quality consultancy in some countries where mining companies, communities, and government lack capacity to act effectively.

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Discussion

Legacy issues

That global mining has significant social, environmental and economic legacy problems is well documented. This has been created through increasingly stringent social expectations, lax legislative and enforcement regimes, irresponsible mining practices, government and mining company collusion, as well as through factors outside the control of the mining operation, such as a global downturn in commodity prices, requiring unexpected mothballing and/or closure.

Legacy issues include:

- Trans-national hazards for human security, especially pollution associated with acid drainage-the largest environmental liability facing the mining industry in places such as Eastern Europe
- Local environmental impacts which can affect the quality of life and livelihoods of people
- Precipitant and possibly uninformed action by governments against delinquent mining companies that have raised barriers to the flow of international and developmental investment
- Unemployment, the loss of social services and amenities, pollution, disturbance of the landscape, the loss of land utility and increased risks to health and safety (Laurence, 2002; Azapagic, 2004).

Applying current principles to historical situations is also a challenge, often resulting in significant costs of abandoned or improperly closed mines remaining unaddressed. Neither governments, nor current mining companies wish to pay for problems relating to the implementation of historical law that now proves to be inadequate in relation to current performance expectations.

Many mining companies are aware that proposals for new mining projects may be rejected because of the legacy left by mines (Australian Government, Department of Industry Tourism and Resource, 2006).

Historical government responses

In the past, mining companies could legally abandon or board up mines, and leave the costs of closure to governments and communities. This practice is now unacceptable.

World-wide, mining companies have reacted to demands for rehabilitation of ex-mining areas by pointing to the lack of foresight of governments to make adequate provision for closure; governments, they argue, that have benefited from taxes and royalties on past activities. From governments' perspectives closure costs have only become evident in recent years and while governments have an interest in preventing harmful environmental and social impacts, few (especially in developing countries) have the institutional and financial capacity to 'encourage' mining companies to deal with old mine sites, either pre or post closure. Many of the owners of these sites can also no longer be traced. Even where legislative frameworks are relatively consistent and compelling with regard to the rights of affected parties, governments are often constrained, politically and economically, from tapping the public purse for allocations of funds to what are often seen as the results of past exploitative practises by the mining industry. In practice, the

longer abandoned mines are left unrehabilitated, the more likely are the socio-economic environmental consequences (such as water pollution) to arise, or worsen.

Current government responses

Today, mining companies are increasingly compelled to plan for closure at the inception of mining projects, and involve affected parties in developing closure plans. These plans describe the steps to be taken by the mining company to minimize the adverse impacts of mining, and to maximize social and economic prospects after mining. Despite legal requirements for closure planning, communities remain sceptical of the intentions of mining companies, opposing mining projects and calling for the cessation of mining in many parts of the world. Efforts to secure a 'social licence to operate' have led major mining companies to make public commitments to sustainable development and improved mine closure practice (ICCM, 2003).

Governments have responded by referencing mining for specific attention in policies on sustainable development, and by issuing legislation and guidelines for mining. For example, in South Africa, the Department of Environment and Tourism recently published a framework for sustainable development (DEAT, 2006) which includes interventions and actions aimed at improving air and water quality, food security, and livelihoods dependent on natural resources. The Department of Minerals and Energy has produced a complementary document for public comment, aimed at implementing sustainable development in the mineral sectors (DME, 2007). Similar policy documents have been prepared by governments in countries in which mining activity is significant.

One such policy response has been the development of the polluter pays principle. In the mining context, difficulties with this principle arise because there is little consensus on how to apportion responsibility for the environmental impacts of closure among the many stakeholders involved (Mitchell, Agle and Wood, 1997).

Other responses

A number of international organizations and initiatives involved in promoting research, transferring technology, coordinating information exchange, and/or extending good practice in dealing with the adverse consequences of closure have emerged. The most prominent (among many others) include:

- The Post Mining Alliance (including Anglo-American PLC among other multinationals) (PMA 2005)
- Canada's NOAMI project to promote knowledge on such issues as community involvement in mine closure, legislative barriers, resource stewardship, and access to finance (NOAMI 2003)
- MEND (the Mine Environmental Neutral Drainage programme) formed by the Canadian government and industry in 1989 to develop and apply new technologies to deal with acid drainage as the major environmental liability facing the mining industry (<http://www.nrcan.gc.ca/mms/canmet-mtb/mmsl-lmsm/mend/mendpubs-e.htm>) and

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- ▶ The International Council on Mining and Metals (ICMM). Formed in 2001 to represent leading international mining and metals companies, the ICMM's vision is 'a respected mining and metals industry that is widely recognized as an essential for society and as a key contributor to sustainable development'. Social tools and research developed by the ICMM include an Integrated Closure Planning Report; a Community Development Toolkit; The Resource Endowment Project; involvement in the development of the ISO 26000 Social Responsibility Guidance; the partnership initiatives for Responsible Mining Assurance and the World Conservation Union; and the responsible mining website.

These organizations and programmes have been formed to try and address as far as possible the fundamental lack of trust between the industry and other stakeholders. This unaddressed legacy of failed mine closures creates doubt about the current commitments of industry and governments to responsible management of mining projects, and government officials are now cautious about issuing mine closure certificates prematurely. These certificates recognize that closure has been completed satisfactorily and that a mining company has no further obligations to government or communities. In Canada, it is estimated that mine closure can take between 2 and 10 years to complete, but where long-term monitoring of environmental and other impacts are indicated, decades could elapse before closure is concluded (Canadian Government, undated).

Principles of closure

The guiding rationale for mine closure today stems from the concept of sustainable development, one mining-related definition of which is 'using, conserving and enhancing the communities' resources so the ecological processes on which life depends are maintained and the total quality of life now and the future can be maintained' (Queensland Mining Council 2001). Best or leading practice refers to the 'best way of doing things' (Department of Industry, Tourism and Resources, Australia 2006) through the application of current knowledge and technologies at a particular site, at a given time.

One of the major shortcomings of the literature and legislation on mine closure, probably due to the complexity and site specific nature of the process, is that closure requirements are seldom specified in detail. As noted by Fourie *et al.* (2006), while the elements of mine closure plans are itemized (including social aspects), there is little or no information on how these requirements are to be met, or why particular approaches should be favoured over others.

Generic principles

The following generic social closure principles relating to company practices are based on the ICMM's Sustainable Development Principles, those of the Minerals Council of Australia (2004), and other 'best practice' perspectives (such as the IIED, 2002 and United Nations, 2002).

- ▶ Building closure into the project life cycle: Mines should be designed, planned and operated to enhance sustainable development, and have more freedom to

achieve these goals at the prefeasibility phase, which freedom declines during the middle phases of their operations (Van Zyl *et al.*, 2002) as problems become more entrenched. Closure design and planning (including the setting of objectives) must thus be developed and updated throughout exploration, mine concept, prefeasibility, feasibility, project approval, construction, operation, decommission, closure of operations, and post-closure biophysical and social monitoring.

- ▶ Setting of social goals: Typical social goals could include rehabilitating the land to its optimum state that takes into account ecological, social, and economic value and contributes to a development path for the region (compatible with local economic development plans) that is viable after mining has ceased. Goals should be aimed at preventing ills rather than mitigating impacts after the fact; this is a cost-effective approach to impact management and is more likely to produce positive results for all stakeholders. Valid goals can be set only in full consultation with those affected by the operation.
- ▶ Stakeholder engagement, consultation and empowerment: Stakeholders, especially those in closest proximity to the mine (the host community) must be identified and engaged at the earliest planning stages of the mine. Engagement must continue throughout the life of mine, on all issues of possible concern or interest to stakeholders, and in relation to understanding expectations and responsibilities of the various stakeholders. Mitigation and management must take into account the social context of the mining project (United Nations, 2002). The social context includes:
 - Demographic and settlement patterns
 - Natural resource utilization
 - Gender, children, health and well-being, traditional roles, and economic issues including gender inequities
 - Contribution of the mining company to community development (throughout the mining life-cycle)
 - Degree of collaboration between stakeholders (mine, community and authorities). Skills, knowledge, experience, and diversity must be used to the maximum effect in reconfiguring mining communities faced with change, and the primary goal must be for communities to develop independence and autonomy from the mining operation.
- ▶ Human rights—Communities (and all other stakeholders) have a right to participate in decisions that affect their lives, and all individuals and groups enjoy rights of self-determination in shaping their post-closure future. Closure plans must therefore respect the civil and human rights of communities.
- ▶ Risks and opportunities: The full range of impacts (risks) of mining activities—negative, positive and cumulative—must be taken into account in the combined project management and risk management approaches to mine closure (Fourie *et al.*, 2006). Typical social risks include conflict over land use and ownership, effects on historic remains or culturally

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valued landscape elements, and obstruction or changes in the local community's use of natural resources through physical impairment of the land (such as subsidence) or through contamination of soil, air or water resource. Mining companies must collaborate with interested and affected parties when determining the optimal risk management response.

- **Resource provision:** Provision for adequate resources should be made to meet closure requirements from exploration through to the point of exhaustion of the mineral resource OR at the point where other factors force 'early' closure. This can be achieved only if the mine closure goals or objectives are specified at the start of mine planning, and reviewed throughout the life of the mine to take into account changing circumstances.

While there may be broad agreement on these principles, difficulties and disagreements often arise in practice.

Closure Challenges: Sustainable Development Principles

Mine closure can have major (although at times unquantifiable) consequences for social development in host communities, in the surrounding local and regional environment, and even further afield.

The outcome of closure has been shown to depend on (i) the mine's investment in time, money and energy in dealing with social disruptions engendered by closure and (ii) the response of the community. Three constructs of closure have been developed from the varying combinations of these factors, namely minimalist, compliance, and sustainable closure. The latter is the understood and stated aim within this guideline for all closure processes (Tables I and II).

Minimalist closure	Compliance closure
<p>The minimum required, such that after closure :</p> <ul style="list-style-type: none"> • Job opportunities have been created that are sustainable • Skills development has equipped people to participate in economic activity on a sustainable basis • Local infrastructure has been developed to service social and economic needs sustainably • Social investment projects and employee welfare caters effectively to human needs into the indefinite future. 	<p>Mining company complies with the regulatory regime, whether or not the regulatory framework facilitates optimal social closure and sustainable development. In South Africa (the most explicit of all Southern African countries in articulating policies and targets for social and community development), this includes compliance with:</p> <ul style="list-style-type: none"> • The Mining and Petroleum Resources Act (2002) • The Mineral and Petroleum Resources Development Regulations (2004) • Various supportive legislation and regulatory provisions related to, inter alia, procurement of services, employment equity, skills development, and training • Local and regional developmental mechanisms—the IDP process • The Mining Charter: Broad-Based Socio-Economic Empowerment Charter for the South African Mining Industry(2005).

Situations where mineral processes simply bring about community change and social justice would be considered minimalist closure

<p>Internationally, sustainable closure process can demonstrate:</p> <ul style="list-style-type: none"> • Ethical business practices • Fundamental human rights and respect for different values, cultures and customs • Valid data and sound science • Continual improvement in health, safety and environmental performance • Biodiversity and integrated land-use planning • The social, economic and institutional development and long-term viability of communities • That oppression and inequality are tackled in a purposeful, continuous, comprehensive and action-orientated manner (Twelvetrees, 1991).
<p>In the local context, sustainable closure processes also:</p> <ul style="list-style-type: none"> • Require that closure is not 'simply' skilling people or providing jobs, but provides for long-term economic diversification • Reflect concrete social realities rather than vague and standard prescriptions • Align indigenous South African social conditions with international best practice • Represent site specific frameworks and strategies derived from systematic developmental research, that are usable on a micro-managerial, step-by-step sequential or concurrent basis • Are deployable on a rehabilitative basis, in cases where closure turns out to be unsustainable.

One of the biggest challenges in achieving full sustainable closure is appropriate and adequate communication with stakeholders

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Stakeholders: principles of identification, engagement, and roles

Stakeholders are those individuals and groups between whom the costs, benefits, rights, and responsibilities for the management of mining legacies are distributed. Stakeholders relating to mine closure include mine employees and related unions; host communities; service providers; people and companies involved in downstream economic activity; government, including local authorities; NGOs; and people involved in the greater economic processes in the region. Many tools are available to the industry to identify their specific stakeholders, and their specific issues (Porritt, 1997).

The literature indicates that communities are characteristically rendered poorer in post-closure situations where rights and interests are compromised by environmental and social damage (Amundsen, 2005; Evans, Goodman and Lansbury, 2000; Gaventa, 1980; Klubbock, 1998; Low and Gleeson, 1998; Scheyens and Ligisa, 1998; Nel, Hill, Aitchison and Buthelezi 2003; <http://www.oxfam.org.au/campaigns/mining/publications/index.html>.)

Goal realization requires engagement when many stakeholders are involved, as with mine closure. Engagement however, presupposes an ability to communicate—a multi-way exchange of ideas. In South Africa especially, assumptions of understanding based on communication are often ill conceived, and capacitation of communities, mine managers, and government officials may be required, before effective communication can occur. Capacitation facilitates the communication of interests and the acquisition of negotiating skills (Gibson, 2001 and www.iied.org/mmsd/mmsd-pdfs/033), and assists groups to develop legitimacy and power in negotiations. Capacity building may be required in the fields of financial management and business, and in terms of understanding post-closure community environmental responsibilities and requirements.

The roles of each stakeholder group depend somewhat on the prevailing legislation, negotiated agreements, the sophistication of the stakeholder base, and the degree of economic development in the area of closure.

Closure needs: the socio-economic and environmental perspective

As demonstrated in the literature, various stakeholders have various needs relating to closure, but in essence:

- ▶ The mine owners/operators wish to achieve liability-free closure within a reasonable time frame
- ▶ The government does not want to be left with high financial or social liabilities
- ▶ Communities want the opportunity to at least maintain, but preferably improve their quality of life
- ▶ The socio-economic activities around the mine need to continue in its absence
- ▶ The environment must be rehabilitated to a point where pollution does not pose an unmanageable threat to life or its processes, and such that a dynamic equilibrium can reinstate over time.

The closure process must be aligned with community expectations, diminished hazard vectors, current industry

expertise, physical equipment, and creative governance (Gammon, 2002). Practices on which this goal can be realized include:

- ▶ Planning infrastructure to usefulness beyond mining
- ▶ Developing an economic base during mining that is not entirely mine dependent
- ▶ Developing the capacity of the local community to manage residual environmental and other risks
- ▶ Encouraging continuation of and developing existing subsistence and other economic activities
- ▶ Government and industry encouragement for innovation in the development of engineering and biotechnological solutions that assist the revalorization of sites, e.g. in the use of operational wastes for advanced mineral extraction
- ▶ Use of site features based on land and remnant infrastructure such as pits, mounds, and waste deposits to create sustainable local level employment. Proven examples include tunnels and voids being adaptable for novel value-added applications such as fish farming and mushroom growing
- ▶ Product manufacture or land use for food production, agro-industry or anthropogenic purposes, i.e. forestry and grazing along with artisanal mining where government and industry underwrite the costs of rehabilitation
- ▶ Site-clearance and cleaning for high value land usages where remediation costs are covered by sale after government zoning changes (e.g. Butchart Gardens in Canada www.butchartgardens.com)
- ▶ Declaration of biosphere reserves in the national inventory of natural areas
- ▶ Special purpose partnerships (e.g. in the USA, where trout fishing associations have taken on the responsibility of rehabilitation streams affected by acid drainage).

The closure process: principles of planning and implementation

Closure planning must be built *ab initio* into mine plans, at the feasibility stage. Plans should be updated regularly, taking into account the changing conditions and expectations throughout the life of mine. Closure activities must similarly begin with mining activities, and continue during/throughout its life cycle (such as concomitant rehabilitation).

Plans must be in place for expected and unexpected mine closure, in as far as provision must be made for sufficient funds for closure to commensurate with the stage of the project life cycle. Best practice suggests that to avoid abandonment, mines should not be allowed to 'mothball'. Mining operations must remain responsible for the execution and completion of successful reclamation, even when operations are relatively new or have considerable remaining lifespans.

Rehabilitation using indigenous vegetation is best practice, and most likely to lead to a dynamic ecological equilibrium. This approach can result in passive management measures being possible sooner than in the case where alien vegetation is used.

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Closure cannot be formulaic, as prescribed by many currently available 'toolkits', due to the complexity of contexts in which it takes place. Modern community developmental research nonetheless suggests the following to be of critical importance for closure planning:

- The size and physical character of the local environment
- Existing infrastructure and services
- Communication networks
- Human/social development
- Quality of governance.

All closure plans must thus address these issues pertinent to the stage of operation of the mine. The following section highlights some of these issues in two South African case studies.

Case studies: findings and discussion

Case study 1: Mine A

Current scenario:

- Remote area, very poorly serviced in terms of social and basic services
- Highly dependent on the mine for employment
- Poverty rife, dependent on subsistence agriculture
- Significantly under resourced government authorities at all levels
- In operation since 1983, closure projected for 2014, when coal reserves will be depleted
- Five years before closing, a mine closure plan has not yet been finalized

Historical context

The mine is very isolated—situated between 150 and 250 km from the nearest other towns, and has been operating for 26 years. The original lease agreement made provision for the payment of royalties and surface rental to the government of the former 'homeland' where the mine is situated. However, since 1994 these have been paid to the DME, and have not been used to benefit the local community.

Current status

Closure is projected for February 2014, based on current scale of operation, production, mining costs and product prices, future economic viability studies, and permission from the DME to continue exploring.

Closure, it is estimated, will have an enormous impact on the mine's approximately 1 000 employees (including 284 contractors) who currently account for mine expenditure to the value of R110 m per annum, and who largely reside in the villages around the mine, as well as towns from which mine labour is recruited.

A social and labour plan (SLP) has been approved in terms of Regulation 46 of the Mineral Petroleum Resources Development Act (2000).

Mine involvement in community upliftment was, however, relatively uncoordinated prior to the mine changing ownership in 2006, after which a number of substantive community development projects have been initiated. These include a winter school that provides an educational

enrichment programme, where the attendance of learners is encouraged by the local department of education; a tourism project that involved the development of a marketable cultural accommodation attraction close to the Kruger National Park; and the establishment of a multi-purpose community centre to serve the community through an effective public-private partnership among the mine, government, and other stakeholders.

The socio-economic context

The mine, whose surface covers 1 000 hectares, is of considerable significance for both the mining company and the South African economy because of its mining of coking coal, and as it is the only major enterprise in the area responsible for the creation of direct, indirect, and induced employment. It is estimated that 42% of the generated jobs in the area are attributable to the mine. Despite this, 80% of people in the area remain unemployed and 60% of households have an income of less than R10 000 per annum, relying mostly on subsistence agriculture.

At least six towns in the municipal area of the mine are at risk of being affected negatively following closure. The mine spends a total of R141 million per annum within the area, on salaries, royalties, utilities, and services.

Social infrastructure remains poor, despite considerable investment by the mine in road development, medical care, and health benefits. Government has not delivered on its commitments to water reticulation, including sewage and electricity; these services are all highly inadequate. Primary, secondary, and ABET educational facilities are old and inadequate, with insufficient teachers, and a very low education level in the area (only 8% with matric). Alcohol and drug abuse are high, as is the incidence of HIV/AIDS.

The recently initiated community development projects by the mine had not as yet made a considerable impact on these adverse social conditions.

The environmental context

Annual rainfall is very low and there is strong competition over water amongst farmers. The mine is able to reuse much of its water, but drought and overuse of river water by farmers is a major issue for many key stakeholders in the SD process.

Mining and processing operations have had a negative impact. The company is committed to environmental planning with financial provision for rehabilitation after closure. However, currently there are numerous complaints about spillage, emissions, dust, noise, and air pollution.

The underground coal spread is some 22 000 hectares but mining activities have never been allowed to interfere with the land use activities of the local inhabitants. The small amount of vegetation removed during mining activities is effectively rehabilitated.

A game park adjacent to the Kruger National Park overlaps the mine lease area and is managed by the mine in accordance with an agreement struck with the Limpopo Department of Tourism in 1990.

Stakeholders and engagement processes to date

Stakeholders of Mine A include five neighbouring communities (including their traditional authorities and

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municipalities), farmers, employees, their representatives and families, local businesses and suppliers, authorities at local, district, provincial and national level, including Departments of Water and Environmental Affairs, Minerals, and Energy.

Community engagement

Since 1994 the mine has enjoyed regular negotiations with IAPs including the local communities and their leaders. The negotiations have focused on incremental mine impacts and socio-economic development issues (agriculture, education, and administration).

During late 2006, the mine was involved in a local economic development (LED) study to identify the concerns of individual and community IAPs at risk from closure, to chart negative impact mitigation and to optimize positive impacts. At the end of 2006 a stakeholder engagement standard was agreed with stakeholders, resulting in more coordinated community development and engagement initiatives.

A detailed socio-economic assessment was undertaken between April and September 2007 with a view to supplementing the social and labour plan (SLP) with a standardized profile. The assessment, which will be repeated, is intended to create a baseline for assessing the impact on local communities as well as addressing stakeholder issues on an ongoing and proactive basis. The assessment process has led to 'a large number' of stakeholders being engaged.

A mine closure plan is to be developed and finalized in the next two years.

Preparations for closure

Although a formal closure plan has not yet been finalized, the

mine has indicated that local economic development as part of mine closure, must be:

- ▶ Sustainable and aligned with the good citizenship business principles
- ▶ Communicated to all employees and other stakeholders
- ▶ Transparent and open to joint monitoring.

Financial provision for the management of the closure and resultant downscaling programme has been made and the existing stakeholder engagement standards are to be updated following the socio-economic impact assessment mentioned earlier.

The company has the legal and ultimate right to implement retrenchments and redundancies in compliance with the Basic Conditions of Employment Act, the Labour Relations Act, and any Recognition Agreement/Retrenchment concluded with the Unions. These make provisions for reasonable notice of retrenchment, the transparent and fair selection of retrenchees, etc.

Provision has nonetheless been made for a representative forum which will deal with achieving optimal consensus around closure in accord with the SLP. The work of the forum will include:

- ▶ Reception of reports governing closure, including warning alerts of retrenchments six months prior to action
- ▶ Developing strategies for turnaround and redeployment in order to minimize job losses and retrenchment in line with both stakeholder interests and the operational requirements of the company
- ▶ Promotion and upgrading the skills of affected employees
- ▶ Procuring technical and advisory services as required by stakeholders.

Table III

Life of mine activities that could affect closure planning

Activity	Actual contribution
Skills transfer	Training budget of R3.1 million (2006)
	Engineering, finance, management, supervising, and other learnerships and part-time bursaries for employees and local students
	Bridging school to assist learners to access university
	Collaborated with the NDA in the development of a skills development centre
	Current ABET training programme on the mine aims to give basic adult education to all employees by 2014
	Will offer SETA accredited training in portable skills to all 160 unskilled and 365 semi-skilled employees during mine lifetime, from 2009, in computer skills, accommodation services, house-building, meat-processing, construction, tourism guiding, conservation, welding, vehicle servicing
	Assisting the employability of learners through the purchase of maths and science equipment for the University of Venda and support of the maths and science winter school for Grade 12 learners
Infrastructure development	The mine has built roads and a new post office
	R20 m spent on housing, including 151 houses in the mine village and single quarters, recently upgraded at a cost of R3.8 m
	Constructed a dam to supply water to the mine in 1997 (but still insufficiently funded to assist with water distribution to local communities)
Health and welfare	Community multi-purpose centre created.
	Establishment of a Section 21 non-profit company to coordinate HIV/AIDS activities
	Upgrading of primary health care facilities
Direct economic development	Local charities and support work—donations for local welfare organizations and activities, policing, recreation, etc.
	BBBEE policy to give opportunities to local communities to tender for services rendered to the mine during the rest of its existence.
	Small business development—driven through the Limpopo Business Development Centre and the Department of Economics and Tourism
	A programme to train farmers in commercial farming

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Only time will tell whether the forum will succeed in creating a shared vision for mine closure between the mine and its stakeholders, and have it implemented in the little time that is left.

Challenges

In the absence of a comprehensive mine closure plan (MCP) and an integrated, timely SD planning, closure of Mine A will most probably negatively affect local and regional development. If socio-economic conditions of communities around the mine have not significantly improved during the past 26 years of mine life, chances are small that the needed improvement (dependent on economic diversification) will successfully take place over the next five years before closure.

With this in mind, closure risks at Mine A include:

- Increased unemployment and poverty levels after closure
- Insufficient levels of skills development for employees to find or create alternative employment after closure
- Insufficient long-term planning for local infrastructure needs, and infrastructure maintenance and use after closure
- Social investment projects and employee welfare hampered by closure
- Severely underresourced and undercapacitated authorities

Learning points

With closure a few years into the future, Mine A has little time left to achieve buy-in, ownership, and support from stakeholders on its closure plan, which has not yet been finalized. Referring to the principles of mine closure from international and local experience, closure planning and implementation needs to be integrated within the full mine life cycle, which has not been the case at Mine A.

The lack of a stakeholder endorsed closure plan, five years before closure, limits the timing of implementing socio-economic aspects of closure, leaving insufficient time to achieve sustainable outcomes.

On the positive side, the detailed socio-economic assessment will provide a solid baseline for closure planning. Extensive engagement with stakeholders during the assessment may also positively affect stakeholder relations and stakeholder participation in the closure forum.

Skills development and community development initiatives that Mine A has already embarked on may contribute to the achievement of closure goals, although the ideal would have been to plan these initiatives within both the closure context and a detailed closure plan.

Case study 2: Mine B

Current scenario:

- Situated in a major coal mining region, 30 km from the closest urban area
- Established in 1978, closure decision taken in 2000, because of depleting coal reserves
- Mining activities ceased in 2002, closure process began
- Ambitious closure plan, but only prepared and implemented after the closure decision was made

- Failed job creation projects, complex closure structures, eventually resulting in high levels of unemployment and deteriorating socio-economic conditions
- Lack of ownership of, and support for closure initiatives from stakeholders
- Infrastructure vandalized, unused and not maintained.

Historical context

Since being established in 1978 Mine B, situated in a major coal-mining region, some 30 km from the closest urban area, has changed ownership a number of times. In some cases ownership took the form of joint venture agreements, as was the case at the point of closure.

Mine B took the decision to close at the turn of the millennium. Prior to the end of mine life in 2002, this was one of the largest opencast coal mines in the southern hemisphere. The mine used board-and-pillar and opencast mining together, to produce around 5 million tonnes of coal per annum for the export market. In 2000, the decision to close was based largely on the exhaustion of reserves. Underground operations ceased in November 2001 and opencaste reserves started being depleted during May 2002. Full-time rehabilitation then began with the completion target being 2007.

Current status

Five years down the line, however, there is considerable evidence to suggest that whereas the mine owners have made substantial efforts to comply with the requirements of good corporate citizenship, and implemented an ambitious closure plan, the closure results have been disappointing and sub-optimal. The mine has ultimately failed to 'close' in legal or technical terms as yet.

Notwithstanding groundbreaking work in environmental rehabilitation, the mine's social plan remains incomplete and an ongoing financial burden both for the community and the new mine ownership, in that the plan has failed to create sufficient and sustainable employment and business opportunities independent of the mine. The ambitious social plan may be viewed as a social experiment that did not create the anticipated results.

The socio-economic context

The mine estate consists of two units, an 'upper' village, historically the home of mine management and senior mine personnel, and a 'lower' village, with many of the social characteristics of an upper-edge apartheid-style township.

The mining town was created by its early owners as a model mine community for others throughout South Africa, when mine closure and its implications were not as yet high on the South African agenda. This included not only relatively good quality housing for lower income personnel, but substantial infrastructure apart from washing plant, slimes dam, workshop, and administrative buildings requisite for mining. These included a dam to supply the mine and village with both potable and industrial water, a primary school with the capacity for 1 000 learners, a clinic, a shopping complex, a church to service various denominations, a relatively good system of tarred roads, stormwater inlets, bulk electricity facilities, a rail connection to Richards Bay, and various recreational outlets to enhance social existence.

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However, since 2002, many facilities in what had been described as a ‘beautiful mine village’ with a wide range of amenities, including the recreation club, have been destroyed, vandalized, or fallen into decrepitude and disuse.

The environmental context

The closure plan contained elaborate planning for environmental rehabilitation, parts of which were unique and groundbreaking at the time. The EMPR was approved by the DME, and environmental rehabilitation proceeded on closure. A local farmer is assisting the current owners with environmental rehabilitation and maintenance.

Stakeholders and engagement processes

When the mine closure process started, twelve stakeholder groups were identified to participate in a community development forum for which an executive body was elected, with a view to representing community opinion.

Consultation was initiated to produce a collective agreement with the unions and associations to downscale mine activities in compliance with labour regulations. A communications structure to keep employees informed of developments was created, along with an information centre to provide employees with advice and counselling.

Contractor services were gradually replaced with mine employees, of whom ultimately 1 132 employees were either placed at other mining operations of the owner company, voluntarily chose to leave the company to pursue their own interests, or—in 536 cases—forcibly retrenched.

Various job opportunities were also identified in the course of articulating the closure strategy. These included employment in small business and manufacturing, poultry production, automotive assembly, agri-processing, hydroponics, silkscreen printing, arts and crafts, as well as the hospitality sector.

Business plans were subsequently drawn up to promote job opportunities for 700 people and, eventually, 10 key initiatives were placed on the entrepreneurial and development agenda at a total investment cost of R3,486,000. These were the SMME’s designed to generate short-term ‘import replacement jobs.’

However, the current situation indicates that these initiatives may have been too little, too late.

Challenges

- The roll-out of the closure plan created a wave of illegal activity in the town, probably as a result of opportunism, fear or uncertainty, and insufficient stakeholder engagement prior to the roll-out.
- Houses destined for mine workers, some of which have been paid for, have been illegally occupied by displaced farmworkers, amongst others.
- Government housing grants have been illegally manipulated, and unscrupulous landlords have been creating overcrowded slums.
- Job creation linked to the social plan has failed. There is huge unemployment in the mine village, and six years after closure its residents subsist in a state of persistent structural poverty. It is estimated that only 239 jobs have been created and that possibly no more than 139 are sustainable, including 62 jobs where ‘people were placed with other employees’. This means that 77 sustainable new jobs exist at this point, representing 11 per cent of the original target of 700.
- With the end of corporate social investment projects, the employment market has shrunk radically.
- Mine leadership failed to effectively comply with the socio-economic assessment and stakeholder

Table IV

Life of mine activities and closure planning

Activity	Actual contribution
Closure structures	A Section 21 (non-profit) company
	Registered Development Corporation (RDC), funded by the Section 21 company
	A consultative future forum (FF),
	A community development trust (RCDT) with:
	An innovative village bank (RVB) funded by the community development trust
Social planning	A task team under the human resources manager with representation from full-time employees responsible for closure leadership with ‘vision and passion’
	Development of a specific economic model to manage downscaling, housing and sustainable growth. More specific plans included:
	<ul style="list-style-type: none"> • In the short-term—SMME development and ‘import replacement’ jobs designed to limit the outflow of money from the village economy • In the medium-term—job creation to allow local residents to provide municipal services themselves through public-private partnerships and other positive economic ventures to be identified and promoted by the Development Corporation • In the longer-term—‘export’ businesses of a global nature based on larger companies with a view to absorbing labour, linking into consumer markets beyond the village boundaries, ensuring competitiveness, continuity and quality business performance
	Conducted a ‘snap survey’ on housing early in the closure process
Infrastructure and services	The provision of affordable housing to employees at below market rate was seen as important in creating legitimacy, cutting the costs of development, and providing the funding flow for ‘village transformation’ along with local economic development through the Section 21 company
	Privatized community services as a means to generate alternative employment
	Appointed a service-provider with skills to create sustainable villages
	Secured ongoing bulk services for the area through proclamation of the mine village as a township of the closest municipality

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engagement procedures recognized globally as critical prerequisites for best practice closure. The community assessment necessary for effective closure was not put in place, and community information did not reflect the true situation, meaning that viable and sustainable socio-economic closure planning has not materialized.

- In a nutshell: the developmental objectives in the ambitious closure plan did not materialize.

Learning points

Comparing the outcomes of closure at Mine B with the core principles of successful mine closure from the international and local experience, the following learning points can be defined:

- Socio-economic closure planning was not integrated in the mine life cycle, but began only once the decision to close was taken
- Stakeholder engagement began too late, with stakeholders being denied their right to co-create the closure plan with the mine—they were presented with the contents of the plan only after the plan was finalized
- Efforts towards economic diversification started too late; similarly, skills development and empowerment of stakeholders began too late to reach sufficient levels for sustainable results in the absence of the mine
- Vague closure goals without specific, measurable objectives
- A reliable socio-economic assessment has not been conducted; hence closure planning had to be based on unreliable statistics and estimates about socio-economic conditions around the mine.

Characteristics related to the socio-economic failure of mine closure

Clustering of characteristics related to the socio-economic failure of mine closure

Risks of mining legacies are ultimately the result of poor industrial and social practices, and failure of developmental governance in most mining countries.

Generic principles

Issues pertaining to government, regulatory authorities, or legal framework

Institutional incapacities prevail throughout most levels of government, when closure matters are considered. The lack of capacity results from people-related constraints, institutional failure, and a poor legal framework. From the perspective of government personnel, undercapacitated departments cannot develop community capacity to participate in closure processes. At the same time, lack of mining and/or social investment experience at local authority level prohibits effective local economic development, and prevents meaningful engagement with the mining company, the community, or investors.

Institutional failure within the different government departments is systemic. Administratively, the lack of integrated planning at the local level and the non-alignment

of closure with regional development plans result in poor job creation and ineffective implementation of the closure plan. These systems incapacities also cause the closure certification process to be long, variable, and inexact. Finally, support services are inadequate in both the governmental and non-governmental sectors in mine closure.

The legal framework contributes significantly to uncertainty in the closure process. For example, there is no uniform defined process for closure risk assessment or management, and no defined level of risk that the regulatory authorities are willing to accept. Over and above these technical issues, the legal requirements for social planning are minimalist, formulaic, and administratively burdensome.

Issues pertaining to strategy, vision, leadership or planning

Poor strategic management planning, combined with unrealistic or inadequate closure visions (that lack concrete principles and assumptions), contribute significantly to the failure of mine closure. There is a perceived lack of all-round quality leadership, which contributes to poor relationships. Trust in mining houses is also compromised when they fail to deliver on closure plans. This may be caused either by an inability to negotiate hurdles to closure, or by an ability—performance gap between closure planning and the company's ability to perform the planned interventions or actions (Warhurst and Mitchell, 2006). Trust and the ability of mines to deliver on closure plans is also compromised through inadequate social planning to manage community expectations and integrate communities into closure from the outset.

Issues pertaining to role definitions or structures

Appropriate closure structures with clear mandates, roles, and responsibilities were not put in place early in the life of mine process. Mine closure committees or advisory panels of key stakeholders (Laurence, 2006) to achieve cohesion and ownership were not formed. A lack of cohesion and cooperation between structures has been identified, which is critical for capacity building, to achieve representative institution-building, partnerships, and effective strategic planning throughout the life of the mine. There has been a need for senior management support, which is crucial for these structures to succeed. Just as important is a clear definition of the stakeholders involved: who is 'the mine', who is the 'community', and who represents government?

Cooperation, and the clear definition of roles and responsibilities of all stakeholders has been inadequate, and the concept of closure solutions could have been better achieved through anchor projects, rather than a clutch of relatively unsustainable SMMEs. It is difficult too to engender identification among communities with too many small projects.

Closure challenges

Economic and financial issues

- Job creation efforts fail because:
 - Projects are too small
 - Projects are unsustainable and not economically viable (Laurence, 2002)

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- Inappropriate projects are developed, which are not suitable for the area or available market/s
- Inadequate funding results from insufficient seed funding and/or follow-up funding (Laurence, 2006)
- The markets are insufficient to support closure projects, due to market saturation or negative external perceptions of areas in decline, and
- Financial planning and provisioning of financial resources is insufficient (James, van Niekerk and Stobart, 2005).

Closure has not been viewed as an opportunity from which industry (and other stakeholders) can profit in the process of dividing liability among several partners. The economic plans for closure models have not made adequate provision for reskilling, redeployment and retrenchment costs as either part of operating costs or as additional closure costs associated with employees. Cash flow projections have been aligned with technical requirements or financial deadlines, rather than with social development needs. Models with creative financial mechanisms were required to avoid those pitfalls that in the past have resulted in negative impacts on the environment or society.

Integration and multiplicity of issues

Closure plans are usually conceived in non-social terms (usually primarily from an environmental perspective), are frequently not an integrated part of planning for the whole lifespan of the mine, from the mine development phase and onwards. Nor are they updated frequently during the life of the mine. This often results in a misalignment among closure, production, and safety goals. Closure planning is usually viewed as a crisis management exercise, and the plans tend to overemphasize or focus on physical, biophysical or environment planning, at the expense of socio-economic aspects, human resource development (Laurence, 2006; Andrews Speed, *et al.*, 2005), and human risk factors. This causes an underestimation of the relative importance of social closure in overall closure plans, and fails to recognize the importance of human needs, irrational impulses, and historically driven emotions.

Closure is seen in minimalist terms as a matter of compliance, not as a vehicle for sustainable development. As a consequence of this lack of appreciation of the business values and opportunities that can be achieved when closure is effectively implemented, closure plans contain little considered thinking about the developmental opportunities in land usage, infrastructure reuse, and the creation of alternative employment opportunities.

Scarcity of resources

A scarcity of resources in the mining, community and government sectors all contribute to poor closure results. Mining companies tend not to have the resources (finances, time, and personnel with the social, behavioural, and development skills to effectively manage the social risks of closure) or willingness to commit these resources to planning and implementing engagement from the outset of mine planning.

There are problems of institutional undercapacity and resource deficiencies to deliver on the execution of mine closure strategy in the government and the non-

governmental sector. These structures often have constraints, or simply fail to provide the support services necessary for effective closure processes. 'Simple' constraints such as access to transport prevent meaningful interventions. Closure can be a life-threatening situation, and this heightens the struggles over scarce resources. The absence of specialist closure practitioners in the South African mining industry remains a limiting factor for successful mine closure.

Stakeholder issues

Communication, engagement, trust, consultation, buy-in, or ownership

Engagement with communities and other appropriate stakeholders is too late in the mining cycle to develop positive relations, or to build both trust and capacity. This lack of early engagement also detracts from the ability to develop the closure process as a joint enterprise (i.e. for all stakeholders to have buy-in to and ownership of the process and its outcomes), or for the development process—including the inevitability of closure to be rooted in the community. The lack of appropriate or inadequate engagement fuels misunderstandings relating to expectations of all stakeholders.

The nature of both internal and external engagement is also problematic. Internally, towards the end of the life of mine, communication over redundancy, retraining schemes, and negotiated agreements is often poorly conceived. Similarly, stakeholder groups fail to engage in good faith, or to honour basic negotiated obligations, which situation is exacerbated by engagement that is too late in the mine life cycle. This creates a lack of trust, which is often fed into by the failure to follow through on the closure plan when difficulties are encountered. Were stakeholders in true partnerships, these hurdles could be better negotiated. This lack of trust has also resulted in hostility towards mining activities by non-government agencies.

Throughout the life of mine, frequent and open communication is often absent. Even where internal workshops are held to identify and discuss anticipated/potential needs and issues, these are often poorly managed with inadequate or inappropriate stakeholder representation. Job creation related to closure projects fails because of a lack of consultation with internal and external stakeholders on the choice or nature of projects. The impacts on communities and prospects for people affected by closure are often exacerbated by a lack of remedial action over future training and reskilling. This creates unrealistic expectations of alternative employment opportunities, long after management sees closure as having 'terminated'.

Issues of capacity or competence

Because the perception remains that closure is primarily related to non-social issues (technical, financial, and environmental) companies often fail to have the commitment, finances or personnel with the social, behavioural, and development skills to manage the social risks of closure effectively. Therefore, no matter how sound the closure plan, mining houses generally lack the ability to deliver on the planned interventions or actions. The lack of effective or

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adequate employee training (Brady, Clipsham, and Thomas, 2004) compounds the negative impacts of closure, including inadequate job creation. Timely capacity building in the areas of leadership development, self-empowerment, conflict resolution, and interpersonal communication is an important success factor in meaningful engagement with stakeholders.

The lack of sufficient sustainable job creation efforts also result from a number of contributory factors, most notably the narrow skills base, a lack of marketing, and a lack of management and entrepreneurial skills (often due to the apartheid legacy of disempowerment). The latter is compounded by limited support structures from the mine, the government, and non-governmental entities, and is as restrictive as funding shortages are to community projects (Nel, *et al.*, 2003:379).

Not all stakeholders are able to engage on an equal footing. Capacitation is especially important as a facet of closure in places such as South Africa where developmental relationships and processes have been seriously compromised by lack of capacity of many stakeholders in the closure process (Hoadley, Limpitlaw and Sheehy). The lack of agreement as to which structures should take responsibility for, especially, community capacity building is problematic, with the mining houses relying on the government to provide this, and vice versa. Capacity is often especially lacking internally, for socio-economic issues, and externally, for business management and technical matters.

Instructional capacity is also lacking within the Department of Mineral Resources, which results in closure being a long and inexact process. This tends to aggravate the lack of trust between stakeholders. Closure planning skills are thus inadequate in all stakeholder groups.

Issues of individual attitudes, motivation, or culture

The lack of early engagement with stakeholders, especially the communities most affected by or most dependent on mining activities, inhibits the development of a systematic profile of the social-psychological orientations of communities, such as popular development expectations, aspirations, perceptions, or social capital networks available in meeting developmental objectives. The closure plans often are misaligned with integrated development plans (IDPs), which heightens planning confusion.

Late engagement processes also lead to the failure of job creation efforts, through intensifying despondency and lack of motivation on the part of community members participating in the projects (Laurence, 2002; Laurence, 2006; Nel, *et al.*, 2003). This late planning also contributes to closure cultures that are immature, procrastinatory, irresponsible, and lacking in confidence. It also gives little time for employee profiling, which is normally poor, and there is little attention given to subjectivities, e.g. employee attitudes, perceptions, and expectations.

The later the closure planning process begins, the greater the absence of psychological preparation necessary to equip the host community for termination of its 'model' existence. Consequentially, when closure is imminent, it can produce panic, anger, and deep feelings of community-wide dislocation.

Closure needs

Diversity and complexities or uniqueness of social processes

The social aspects of closure are usually underestimated in terms of their complexity and importance relative to environmental, economic, and technical issues. This is a foundational factor in the failure of closure processes. Human responses to uncertainty can be irrational, emotional, or seemingly baseless, and the technical planning usually undertaken for closure fails to recognize these subtle social nuances.

Closure fails when the closure processes of developed countries are transplanted in developing country contexts, without adequate modification or consideration of historical and/or current social states, or the unique and indigenous features that determine the outcomes for our own closures. Developing countries especially tend to have legacies such as persistent cultural tensions, structural poverty, and unresolved poverty in the rural areas where most mine closures take place, to which little attention is paid in the closure design. In developing countries as well, there tends to be greater diversity and heterogeneity within stakeholder groups, which is again, poorly understood by closure planners. This diversity requires an even higher level of understanding of complex real-life situations, and negates the use of formulaic closure plans, irrespective of how comprehensive they might be; an expectation of which they usually fall short.

Diversification of the economy takes a long time, especially in developing country contexts. This is generally not recognized, and its effects are compounded by late closure planning.

Process issues

Naivety manifest in underestimation, under emphasis, assumptions, presumptions, and the like

A cross-cutting theme of characteristics related to the socio-economic failure of mine closure is either poor judgement or discernment about known issues. This is evident in a variety of ways, including the following:

- Underestimation of, and lack of attention to known problems
- Lack of appreciation of, and failure to fully understand known complexities
- Underemphasis and underestimation of the importance of known risk factors or mitigation measures
- Failure to recognize and acknowledge obvious or inevitable problems
- Assumptions and presumptions that are invalid, untested, or unfounded
- Ignoring existing knowledge in the form of case studies, closure principles, and implementation plans and
- Inadequate gathering of information.

The importance in these instances is that the issues were known. Measures that could have been put in place were omitted or overlooked, and the negative impacts of the issues were potentially avoidable.

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Issues about lessons to be learned, the need for research or analysis, international best practice, or the application of external processes

Lessons have been learned in closure processes to date, both locally and internationally. However, research into the social aspects of closure remains poor, with a lack of systematic, high quality, creative research into community networks, human capital, and developmental possibilities. Data on the physical characteristics of communities remains poor, based on partial secondary information of dubious quality. Contributing to closure failure is the fact that the processes still in the planning stages fail to take these lessons or the results of research into account.

Systematic profiling of communities or mapping of stakeholders (including employees) is usually absent. Characteristics that should be included in such profiling include:

- ▶ Physical, social, and psychological features of the community (in order to devise a suitable closure plan and to understand the likely responses to suggested options)
- ▶ Analysis of the potential factors that could cause a project to succeed or fail and to ensure long-term support, training, and self-empowerment on the part of the community
- ▶ Understanding the interests and social risks, attitudes, perceptions and expectations, local resources, skills, and capacities
- ▶ Profiling the psychology of 'stranded' communities
- ▶ Studying the dynamics of labour relocation.

Because these issues are poorly understood, the management of stakeholder expectations usually falls short, resulting in raised expectations of delivery and simultaneously curtailment of the likelihood of the success of those very same processes.

Unmodified transplanting of externally developed processes will almost always lead to failure of the process. A better and more balanced distillation of the local and international experience in designing closure models for South Africa is needed, as is a more effective alignment of closure practice with social research on sustainable community development. The 'principles' of integrated and sustainable closure need to be shared between the least and most developed nations heavily involved in mineral extraction activity.

No systematic profile of the legacy issues

Our apartheid inheritance is seriously prohibitive of effective social closure. There is often a failure to recognize the history of separation and non-communication, as well as the fact that communities' human and economic poverty has undermined the sense of self-reliance. There is similarly a lack of appreciation of historical and inherited circumstances such as social geography being basically set in South Africa (SA) by segregationist principles that drove the apartheid society.

There are deep structural and institutionalized constraints to sustainable development in SA, and often closure planning fails to take this into account, and unrealistic or unachievable goals are set. This is compounded by the presumptions of stakeholder support based on the duration of the life of the mine, which is usually lacking.

The factors relating to closure that are affected by our apartheid legacy are widespread and include poverty, cultural tensions, disempowerment of certain groups, poor inter-stakeholder communications, lack of accountability, and apparent 'collaboration' between government and mining companies.

Finally, successful closure is impeded by the massive costs of developing sustainable solutions for job creation, alternative usage of infrastructure, and environmental rehabilitation—a situation that is complicated by the common late stage of closure plan initiation.

Issues of timing and time span of activities

Mine closure planning and interventions start too close to the due closure dates. Mine closure planning must be integrated with mine planning from the earliest possible stage to design out potentially adverse impacts when design and layout are first structured. At least five to ten years are needed to build a relationship with the community (through frequent and open communications), to negotiate its development agenda and then to test and ultimately roll-out closure plans. Failure to do this results in inadequate time to break the dependency cycle and build capacity where it is needed. Closure plans are often inflexible, resulting in social and labour plans being frequently unsystematic or out of date.

The guideline for socio-economic aspects of mines closure

A guideline for the socio-economic aspects of closure in the developing country context has been generated as a result of the research captured in this report. This is contained in a separate report entitled 'The Socio-economic aspects of mine closure and sustainable development: a guideline for the socio-economic aspects of closure: Report 2 of 2 for CoalTech 2020'. The Guideline can be used as a standalone document, or can be applied in conjunction with this report (Report 1 of 2), which creates the context for the guideline.

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