



South African minerals industry: implications of downscaling

by M. H. Solomon

Together with the previous article by J. Rocha and J. Bristow this paper by Michael Solomon, also from the MEPC in Johannesburg, provide a thorough discussion of the effects of lower gold prices and the subsequent downscaling of the South African mining industry. MEPC is an autonomous policy research body aiming to present policy options and their implications to the South African stake holders and decision makers in the minerals industry. MEPC has established itself as an independent source of policy ideas and a facilitator in the policy developing process in South Africa.

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Current discussions on mineral investment, a pertinent issue in South Africa at present, tend to be dominated by issues of political risk rather than technical risk. With the opening up of Africa, Indonesia, South America and the former Soviet-bloc states, vast new geological inventories have come on to the market, made all the more attractive by the new technology available to explorationists. Decisions as to whether to invest exploration expenditure seem to depend on an assessment of the volatility of the country concerned.

Mining Journal recently published an interesting collection of papers called 'View from the Helm'.¹ A number of significant points are made in this respect. In considering risk assessment for investment a major factor is the effect of changing political climates on mining and mineral processing. The major challenges facing the minerals industry in this regard are:

- the hazards of keeping track of political developments in an era of unprecedented political change;
- the collapse of socialist ideology;
- global communications; and
- the environment.²

Mining is no longer merely an applied science or the domain of rough-neck prospectors and gung-ho mining engineers. Today it is the social dimensions that present the greatest challenges.³ Mining companies have to be increasingly cognisant of social issues, and be able to navigate their projects through a maze of laws on everything from tenure to taxation, with consideration being afforded to rights, cultures and the environment. Mining is, and will increasingly be, far more complex, difficult and demanding than it has been in the past.

Africa is a developing continent, and 'sustainable development' is the current buzz-word of emerging governments and aid agencies. The key to a sustainable economy is a balanced and harmonious integration of the social, environmental

and economic dimensions of society and industry,⁴ which includes the mining industry.

Developing economies in Africa are typified by increasing environmental and social awareness, disease, infrastructural and communications difficulties, economic restructuring, fiscal imbalance and uneven growth patterns. This was demonstrated graphically by Frank Gregory in his paper⁵ on Africa's offering to the world of mineral investment. For any African government, the quest for a sustainable economy has to incorporate a somewhat Utopian harmonising of the interests of both multinational mining companies and the societies of the countries in which they operate. Mining companies, by the very nature of their interaction with emerging democracies in Africa, become instruments of social change by:

- forcing issues such as human rights and government legitimacy as pre-requisites for investment;
- assuming responsibility for regional social and economic development (through, for example, infrastructural development);
- promoting legal and institutional evolution supportive of foreign investment;
- acting as catalysts in the transfer of environmental policies and procedures;
- establishing strong, mutually beneficial relationships with aboriginal peoples; and
- resolving land-use conflicts.⁶

In countries where there is little industrial development, secondary industrial development in the wake of minerals development becomes a critical issue. Sustainability of minerals projects requires of companies an involvement in a number of traditionally non-core activities such as small business development, inter-cultural communication and social development.

This social engagement frequently becomes a means of mining companies positioning themselves as preferred investors in developing countries.

The somewhat arrogant attitude of many South African mining companies moving into the rest of Africa that they have a right to invest and operate based solely on free market principals and on society's need for mineral products is becoming less and less compelling. Along with the weak state of the rand and the headstart that Canadian, Australian and American companies have had in the new rush for Africa, this attitude threatens to become a major disadvantage for South African operators competing for minerals investment opportunities in Africa.

It is critically important for mining companies to appreciate that their social responsibilities in the countries in which they are investing extends beyond the creation of job opportunities, corporate social investment and rehabilitation. They have a significant role to play as vehicles for economic and social development, and they need to take this role seriously as it may well be the basis of the industry's future in the light of the increasing pressure being placed on mining companies by the environmental lobby.

A good example of this is the recent decision by the South African government not to allow mining at St Lucia. Richards Bay Minerals has a world class rehabilitation programme, an admirable corporate social investment strategy, and a highly sophisticated communications campaign, and yet they were unseated by a small, but well organised and militant environmental lobby. Their strengths were just not enough to ensure the company's future, and the financial losses in wasted effort and lost exploitation opportunities are huge.

This paper is intended to add another dimension to the area of social responsibility and social engineering: downscaling and the cost of closure of mines. As yet this has not become an investment issue, but it is likely to become yet another hurdle for mining companies to negotiate in the future.

Downscaling of minerals industries

Minerals are a wasting asset and mine closures are an inevitability. Few people, particularly governments and decision makers, begin to understand the implications of mine closure. When mining companies invest in developing countries, they are welcomed by the authorities with open arms (and all too often, open palms). However, mining companies are frequently seen by the people as economic colonists to be treated with the greatest suspicion and contempt. The employment created is considered as a right and not necessarily as a privilege, and the foreign investing companies are often seen as unfairly exploiting the birth-right of the people. Politicians may appreciate the importance of foreign investment, skills and technology, but the 'exploited' masses seldom do. Consequently, when mines close down through economics or operating difficulties, the mine owners are seen as heartless bastards, solely responsible for the unemployment, eco-

nomic woes and social misery created by closure. Pressure is put on the mines for compensation at a time when they can least afford it.

Planning for mine closure at the outset of a project must become an investment consideration, and clarity with officialdom, communities and labour about the life of a mine and the timing and implications of closure is essential. As with rehabilitation, there is a cost to closing a mine, starting with retrenchment packages and running into numerous other compensations requested or required by labour, communities and authorities. The total final cost has to be built into the investment equation, both at a financial and a relationship level.

Mining as a catalyst for infrastructural development

Economically, mining is a wonderful industry, despite what the environmental lobby has to say about it. The industry is a major employer in many African countries, and in South Africa is the

Table 1. National minerals industry employment.

	Employed	Per cent EAP ¹	Wages		Wages/worker		Per cent mining revenue
			Nominal MZAR	Real MZAR	Nominal kZAR	Real kZAR	
1985	806 000	7.5	5 400	5 400	6.7	6.7	21.4
1986	828 000	7.5	6 500	5 400	7.8	6.6	22.2
1987	827 000	7.3	7 800	5 600	9.4	6.8	27.2
1988	805 000	6.8	8 900	5 700	11.0	7.1	26.5
1989	795 000	6.6	10 200	5 700	12.8	7.2	27.4
1990	777 000	6.2	11 800	5 800	15.2	7.4	28.3
1991	719 000	5.6	12 600	5 400	17.5	7.4	29.0
1992	662 000	5.0	12 600	4 700	19.0	7.1	29.8
1993	614 000	4.5	12 700	4 300	20.7	7.0	25.3
1994	610 000	4.3	13 600	4 300	22.3	7.0	25.3
Change 1985-94	-24.3	-42.7	+151 300	-21 400	+231.8	+3.8	+18.2

Note: Economically active population.

Source: Minerals Bureau.

Table 2. Gold mining industry performance 1985–1994.

	Production		Sales nominal		Sales real		Working costs			
	tons	Baseline per cent	ZAR billion	Baseline per cent	ZAR billion	Baseline per cent	Nominal ZAR/kg	Baseline per cent	Real ZAR/kg	Baseline per cent
1985	672.9	100.0	15.3	100.0	15.3	100.0				
1986	640.0	95.1	17.3	113.1	14.6	95.1				
1987	604.3	89.8	17.6	114.5	12.8	83.2				
1988	619.9	92.1	19.8	128.8	12.7	83.0	20040	100.0	20040	100
1989	605.1	89.9	19.5	127.2	11.0	71.4	23340	116.5	20349	101.5
1990	607.7	90.3	19.1	124.3	9.4	61.0	25733	128.4	19606	97.8
1991	605.1	89.9	19.4	126.2	8.2	53.8	26136	130.4	17271	86.2
1992	613.0	91.1	19.5	127.2	7.3	47.6	26373	131.6	15305	76.4
1993	619.3	92.0	23.2	151.5	7.9	51.6	27547	137.5	14567	72.7
1994	579.9	86.2	25.0	162.7	7.8	50.9				

Source: National Union of Mineworkers.

largest employer next to the State (Table 1). However, in addition to creating jobs, the industry fields numerous benefits for the host country. New mines generally

occur in remote and rural areas. With the development of a mine comes physical infrastructure (houses, roads, schools, hospitals, shops), bulk infrastructure

(electricity, water), administrative infrastructure (companies, government), and financial infrastructure (investment, financial services). As this infrastructure is generally part of the capital cost of the project, the authorities are often relieved of the responsibility for the creation of this infrastructure. It thus becomes economically possible for secondary industries such as light engineering and services to be established in mining towns, and to supply cost-effective services to rural areas. This is an important developmental consideration.

An associated issue for the authorities is that while mines are in operation, the maintenance of this infrastructure is also paid for by the mine either directly through the management and operation of mining townships, or indirectly through the provision of housing subsidies and payment of municipal rates and taxes for employees. The mines are thus in effect subsidising much of the country's rural infrastructure, which is a major incentive for governments.

As an investment strategy, these are strong points of leverage to be used when negotiating with governments in respect of mineral rights, taxes and royalties. Qualified and quantified appreciations of

Table 3. Historical labour levels on South African gold mines 1986–1992 (in thousand workers).

	1986	1987	1988	1989	1990	1991	1992
South Africa	266	273	265	246	224	194	171
<i>Index</i>	100	103	100	92	84	73	64
<i>Yearly change per cent</i>		2.6	-2.9	-7.2	-8.9	-13.4	-11.9
<i>Average 1987–90</i>		-6.9		<i>Average 1990–92</i>			-11.2
Lesotho	104	106	101	101	98	88	84
Mozambique	56	46	44	43	43	42	42
Botswana	19	18	17	16	15	13	11
Swaziland	14	16	16	17	16	16	15
Malawi	18	18	13	2	0	0	0
Total Foreign	211	204	191	179	172	159	152
<i>Index</i>	100	97	91	85	82	75	72
<i>Yearly change per cent</i>		-3.3	-6.4	-6.3	-3.9	-7.6	-4.4
<i>Average 1987–90</i>		-5.3		<i>Average 1990–92</i>			-5.3
Total workers	477	477	456	425	396	353	323
<i>Index</i>	100	100	96	89	83	74	68
<i>Yearly change per cent</i>		0.0	-4.4	-6.8	-6.8	-10.9	-8.5
<i>Average 1987–90</i>		-6.2		<i>Average 1990–92</i>			-8.7

Table 4. Projected retrenchments on South African gold mines 1993-2000 (7-year average, thousand workers).

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
South Africa	159	148	138	128	119	111	103	96	89	83	77	72	67
		11	10	10	9	8	8	7					
Lesotho	80	75	71	68	64	61	57	54					
Mozambique	40	38	36	34	32	30	29	27					
Botswana	10	10	9	9	8	8	8	7					
Swaziland	14	13	13	12	11	11	10	10					
Malawi	0	0	0	0	0	0	0	0					
Total foreign	144	136	129	122	116	110	104	98	93	87	81	75	70
		8	7	7	6	6	6	6					
Total workers	303	284	267	250	235	221	207	194	183	170	158	147	137
Retrenchments		19	18	16	15	14	14	13	12	13	12	11	10
Progressive retrenchments		19	36	53	68	82	96	109	121	133	145	156	166

the multiplier effects of a mining project could be powerful tools in negotiations with host governments, and should not be overlooked or under-estimated.

Mine closure

The generation of economic activity through the development of the minerals industry must, however, be qualified by the caution that minerals are a wasting

asset. One day all mines must die, as sooner or later they run out of mineral reserves. The positive effect of employment and livelihood creation is thus reversed, and for every mine job lost through retrenchment, ultimately many more jobs are lost in other sectors. Moreover, the burden of maintaining rural infrastructure set up and serviced by the mining companies reverts to the authorities.

Downscaling of the minerals sector is one of the most serious economic and social problems facing the South African economy at present. The positive aspects of establishing mines always seems to overshadow planning on the part of the authorities to sustain development after mine closure and to optimally utilise the economic momentum created. This paper will attempt to demonstrate the effect and extent of the problems caused by downscaling.

Table 5. Projected retrenchments on South African gold mines 1993-2000 (3-year average, thousand workers).

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
South Africa	152	134	119	105	93	83	73	65	60	56	52	49	45
		17	15	14	12	11	9	8					
Lesotho	80	75	71	68	64	61	57	54					
Mozambique	40	38	36	34	32	30	29	27					
Botswana	10	10	9	9	8	8	8	7					
Swaziland	14	13	13	12	11	11	10	10					
Malawi	0	0	0	0	0	0	0	0					
Total foreign	144	136	129	122	116	110	104	98	142	133	123	115	107
		8	7	7	6	6	6	6					
Total workers	296	270	248	227	209	193	177	163	203	189	176	163	152
Retrenchments	27	26	22	21	18	16	16	14	5	14	13	12	11
Progressive retrenchments		53	75	96	114	130	146	160	170	180	190	199	208

Table 6. The probable effect of the gold price on job losses in the South African gold mining industry.

	<\$300/oz	Gold Price \$300-\$400/oz	>\$400
Probability (MEPC estimates)	10 per cent	60 per cent	30 per cent
1996–2000 (NUM estimates)	250 000	80 000	30 000
2001–2005	75 000	75 000	40 000
Totals (MEPC calculations)	325 000	155 000	70 000
Projected retrenchments 1996–2005		146 500	
Annual average approximately		14 500	

Downscaling of the industry by sector

Gold mining

Gold mining is still the most important sector of the South African minerals industry, and the greatest employer of mine labour. Downscaling in this sector therefore, which is rapidly gaining

Table 7. Retrenchments from South African gold mines, 1994–95

Mine	Numbers retrenched
Vaal Reefs	1 781
Western Deeps	1 899
Freegold	2 786
Buffelsfontein	1 518
REGM	1 577
Blyvoor	2 815
Durban Deep	4 517
Harmony	2 287
Primrose	1 600
Other mines	2 340
Total	23 120

Source: National Union of Mineworkers.

momentum, is a serious problem. The industry's performance (Table 2) shows a consistent decline over the last decade.

What is seen here is a decline in gold production of some 24 per cent over the last decade, accompanied by a drop in revenue in real terms of almost 50 per cent. This drop in revenue has to a certain extent been mitigated by relatively good maintenance of working costs, which have in fact dropped by some 28 per cent in real terms. The drop in operating revenue is thus around 22 per cent in real terms, which is still extremely serious.

It is estimated by government⁷ that gold production will drop to 416 t by the end of 1997. This could lead to a loss of as many as 111 000 jobs. This figure coincides approximately with the calculations in Table 5 (109 000).

Looking at the historical pattern of retrenchments in the gold mining industry is sobering. Between 1986 and 1992 the industry shed 124 000 jobs, a drop 32 per cent overall. Interestingly, the drop in South African jobs was 36 per cent as opposed to 28 per cent for foreign workers. This means in effect that more South

Africans jobs are being lost than migrant jobs.

As the retrenchment figures available in Table 3 only extend to 1992, the projections produced in Tables 4 and 5 start at 1993. Taking the seven-year average (1986–1992) for the data available, these figures indicate that between 1993 and 2000, should current trends continue, approximately 109 000 jobs stand to be lost in the gold mining industry by the end of the decade, and 166 000 over the next 10 years. However, Table 3 indicates an acceleration in retrenchments after 1989. If one uses the same model with a three-year average (1989–1992) the picture changes dramatically (Table 5). If this trend continues, which appears to be the case if one considers Table 5, the respective figures are 153 000 and 208 000. Using a different approach of estimating mine closures with various gold price probabilities, the indications are that around 14 500 jobs might be lost annually (Table 7), which, like Table 8, seems to confirm the scenario presented in Table 5.

In reviewing these statistics, it has to be appreciated that these scenarios are merely an exercise in manipulating available data in order to establish the order of magnitude of the problem. Much more thorough statistical work needs to be done in order to get definitive, qualified impacts.

The three independent calculations indicate a close enough correlation to enable the magnitude of the problem to be stated with some confidence despite the obvious problems with the data used.⁸ Figures for retrenchments that took place in 1994 and 1995 (Table 7) show that over those two years 23 120 workers were retrenched. This unfortunately confirms the trends predicted above.

It would appear that the trends are to continue. The indications are that the crisis at the Freegold mines in the Free State could result in the closure of 11 shafts at the cost of 32 000 jobs.

Table 8. Annual employment by sector (in thousand workers).

	1990	1994	Average annual decrease per cent	1996	2000	2005
Gold	396	274	-6	241	187	136
Copper	9	6	-7	5	4	3
Platinum group	107	96	-2	92	85	7
Chromite	9	6	-7	5	4	3
Other sectors	256	228	-2	218	200	179
TOTAL	777	610	-4	562	479	397

Platinum group metals

Downscaling is not restricted to the gold mining sector. The following estimates of downscaling in the other mineral sectors will be drawn directly from Minister Botha's written reply to a question in Parliament on 21 February 1996.⁹

South Africa produces 52,7 per cent of the world's platinum group metals (PGMs). While there has been a net increase in PGM production over the last decade from 121,7 t to 183,9 t. The real price in Rand terms of PGMs has

dropped over the same period from R16 923/kg to R11 116/kg. This has resulted in a decline in employment levels between 1991 and 1994 from 106 609 to 96 458, a drop of 9,5 per cent in four years, or an average of 2500 jobs a year.

The possibility of closure of at least one platinum mine, along with the cut-back in labour to meet rising production costs against a static platinum price, could conceivably result in the loss of 10 000 jobs to the industry over the next two years.

Diamonds

While not affected in the same way as the gold mining industry in terms of the numbers of retrenchments, the diamond mining industry is relatively speaking in far greater crisis with respect to downscaling, particularly in the Northern Cape. Closure of the Namaqualand mines (Kleinsee, Koingnaas and Alexkor) and the major De Beers operations in Kimberley is expected within the next 10–15 years. These closures will affect some 5000 mine workers, and has grave consequences for the host regions, particularly Namaqualand.

Copper

Between 1985 and 1995 South African copper production dropped 40 000 t from 205 000 t to 165 000 t (19,5 per cent). Exports dropped over the same period from 128 000 t to 82 000 t (35 per cent). Phalaborwa may be converting from an open cast operation to an underground mine by the end of the decade, but the open cast operation is reaching the end of its life. O'Okiep Copper Mines in Springbok, while continuing with an aggressive exploration programme, report-

Table 9. Overview of the South African minerals industry 1994.

	Tons produced	Local MZAR	Export MZAR	Total MZAR	Per cent mineral product
Gold	579 909 kg	0	24 953.1	24 953.1	38.55
Coal (total)	195 805 440	5 520.3	4 812.5	10 332.8	15.96
Platinum group	183 925 kg	0.0	5 747.8	5 747.8	8.88
Misc. (inc diamonds)		1 688.5	3 957.5	5 646.0	8.72
Iron ore (total)	32 321 215	347.4	1 052.9	1 400.2	2.16
Copper	165 213	681.2	573.6	1 254.8	1.94
Manganese ore	2 851 158	265.4	379.5	644.9	1.00
Aggregate and sand		572.1	0.0	572.1	0.88
Nickel	30 135	275.9	274.3	550.2	0.85
Chrome ore	3 599 472	226.9	173.1	400.1	0.62
Granite/norite		18.7	244.6	263.4	0.41
Zinc	76 361	113.6	2.6	116.1	0.18
Lead	95 824	3.2	83.0	86.2	0.13
Silver	195 794 kg	7.3	70.8	78.1	0.12
Other		6563.8	6120.6	12 684.4	19.60
TOTAL		16 284.3	48 445.9	64 730.2	100

Table 10. Minerals sector contribution to gross domestic product and gross domestic fixed investment 1985–94.

	GDP per cent	GDFI per cent
1985	14.8	11.9
1986	15.4	14.5
1987	12.5	14.8
1988	11.8	14.4
1989	10.6	13.7
1990	9.7	13.3
1991	9.2	13.3
1992	8.6	11.4
1993	8.8	8.8
1994	8.7	9.0

edly¹⁰ has 4-5 years' life left based on current reserves.

Job losses in the copper sector are reported to have been from 9437 to 5646 between 1990 and 1994, a decline of 40,2 per cent .

Chromite

Chromite production has fallen recently primarily due to the replacement of chromite by less toxic substances in the manufacture of refractory bricks. The purchase of cheap chromite from Kazakhstan has exacerbated the problem. Between 1985 and 1994 the unit price of chromite declined in real terms from R101,40/ton to R59,90, while production costs rose in real terms. Employment in the sector dropped 50,1 per cent from 9207 in 1990 to 4590 in 1994. A further 1500 jobs are threatened in the next two years.

Iron ore, coal and other minerals

Despite the increase in iron ore production from 24 to 32 Mt over the last decade, the industry still shed 9,6 per cent of its jobs between 1990 and 1994 (6762 to 6112). No further immediate to medium-term losses are anticipated.

Despite the fact that employment in the coal industry dropped from 86 656 to 60 187 (30,5 per cent), no further downward movement is expected, while other

sectors, employing around 45 000 workers, are expected to lose some 17 per cent, or 7 700 jobs in the next two years.

The impact of mine closures on other sectors

All too often the linkages between sectors is seen in terms of input—output analyses. General Equilibrium Models built by organisations such as the Industrial Development Corporation represent these interdependencies quite effectively and are no doubt of great interest to economists. However, they are of little practical value to mine planners and the suppliers of goods and services, nor to social planners. If one accepts the argument mooted above that mine planners need to build closure into the planning equation of the life of a mine, it follows that information needs to be provided to all suppliers of goods and services as well as to economic and social planners.

Individually and collectively, information supplied by mines to suppliers and to the authorities provides for certainty that can be reflected in planning for economies of scale that ultimately directly benefit the mines themselves. Mine closures in turn reduce these economies of scale and increases unit costs of supplies. As fairly close records of consumable usage have been kept by the state over the years, it is possible for the individual suppliers to estimate market consump-

Table 11. Contribution of the minerals sector to state revenue 1985–94.

	Taxation ZAR billion	Other ZAR billion	Total ZAR billion	Per cent total revenue
1985	1.8	0.4	2.2	9.7
1986	2.9	0.7	3.6	12.5
1987	3.5	0.9	4.3	13.1
1988	2.8	0.7	3.6	9.5
1989	2.6	0.6	3.2	6.7
1990	2.3	0.5	2.8	4.4
1991	2.2	0.4	2.6	3.8
1992	1.2	0.3	1.6	2.1
1993	0.9	0.2	1.1	1.4
1994	1.0	0.3	1.3	1.4

tion of their goods over fairly extended periods, provided that they are adequately informed of the chronology and extent of mine closures.

While reliable statistics are available from various sources on the supply side of mining, their major use is in the development of trend analyses, which have limited value to strategists. It should be an accepted responsibility of mining companies, or their representative organisations, to collaborate with suppliers on joint planning. This could in turn lead to mining industrial clusters and rationalised supply lines that could stem the ever-rising cost of mining supplies. The

Table 12. Contribution of the minerals sector to exports 1985–1994.

	All minerals per cent	Gold per cent	Change per cent	Other per cent	Change per cent
1985	66.7	43.4		23.3	
1986	66.0	42.5	-2.1	23.5	0.9
1987	60.0	40.3	-5.2	19.7	-16.2
1988	57.7	38.0	-5.7	19.7	0.0
1989	57.1	33.8	-11.1	23.3	18.3
1990	54.2	31.2	-7.7	23.0	-1.3
1991	53.2	30.0	-3.8	23.2	0.9
1992	49.1	29.0	-3.3	20.1	-13.4
1993	51.2	29.5	1.7	21.7	8.0
1994	48.0	28.0	-5.1	20.0	-7.8

concept of industrial clusters is not new, but is a relatively novel concept in the mining industry here. The question remains as to whose responsibility it might be to initiate cluster programmes and to investigate the potential merits of these - industry, suppliers or government?

From a social planning perspective, the linkages can be more generally defined. A commonly used multiplier for the mining industry is 2,5 jobs outside the industry for every job in the industry. The figure can be higher. In a recent study done on Richards Bay Minerals the figure was found to be 5,8 to 1. The implications of this are frightening. The gold mining industry stands to shed 136 000 first order direct jobs¹¹ by the end of the century, which will affect some 340 000 first order indirect¹² and second order indirect¹³ jobs. The indications are that by 2005 these figures may have escalated to 225 000 and 413 000 respectively (see Table 13).

Total job losses due to downscaling could thus amount to 480 000 and 790 000 over the next 10 years. If these indications are in any way correct, this represents an economic and social crisis of national proportions. Put in the context of the country's Reconstruction and Development Programme and Economic Plan, downscaling could well derail any attempts at economic and social renewal by the country.

The downscaling of the mining industry thus becomes much more of a problem for secondary and tertiary industry, and for the government and the country

as a whole, than it does for the mines themselves. All indications are that this is not adequately appreciated by either industry or the government.

The macro-economic effects of downscaling

The South African mining industry

In order to contextualise the discussion in this paper, it is necessary to present an overview of the mining industry in South Africa.

The modern South African economy can be considered to have started in 1851 with the development of the copper mines in Springbok. Prior to that there had been little industrialisation of any note. However, the main economic thrust came through the discovery of diamonds in Kimberley, which in turn provided the financial basis for the development of the Johannesburg goldfields. The development of large-scale mining provided the impetus for the development of the coal mining and steel industries, and hence the bulk of the country's manufacturing industry. The mining companies still play a major role in the rest of the economy through the concentration of ownership that they enjoy in other sectors.

Macro-economic considerations

In 1994 the minerals industry accounted for 8,7 per cent of the country's Gross Domestic Product (GDP) and 9 per cent of the Gross Domestic Fixed Investment (GDFI) (Table 11), 1,4 per cent of the

State's revenue (Table 12), and 48 per cent of exports (Table 13).

The declining role of the minerals sector in the economy is immediately apparent from these tables. Over the last ten years, the minerals industry's contribution to GDP has declined 41,2 per cent from 14,8 per cent in 1985 to 8,7 per cent in 1994. Contribution to GDFI has declined 24,4 per cent from 11,9 per cent to 9 per cent, State revenue no less than 85,6 per cent from 9,7 per cent to 1,4 per cent, and exports 28 per cent from 66,7 per cent to 48,0 per cent.

Further examination of these figures shows that a fall-off in gold production and exports is the major contributor to these trends. For example, the decline in gold exports is 35 per cent as opposed to 14,2 per cent of other minerals. Gold still dominates the country's mineral production by value. In 1994 it accounted for 38,6 per cent of the total value of minerals produced (Table 9). This must be compared to 16 per cent for coal, 9 per cent for platinum, and 36,4 per cent for the rest of the industry.

The decline of the relative value of the minerals industry is a mixed blessing in that it indicates a move away from dependence on minerals. It is nevertheless a cause for concern as minerals remain South Africa's most important natural economic asset.

What of the mining industry's wage bill? Since 1985, employment on the mines has declined from 806 000 to 610 000 in 1994, a fall-off of 24,3 per cent (Table 6). Over the same period wages rose nominally by 151 per cent from R5,4 billion to R13,6 billion, but in real terms (discounted by the consumer price indices from year to year) dropped from the base of R5,4 billion in 1985 by 21,4 per cent to R4,3 billion in 1994. Despite the decline in the work force, this indicates no real benefit to the miners' individual pay packets during that period. This is confirmed by the average wage per worker. While nominal wages per worker have risen 232,8 per cent over the decade, wages in real terms have increased by only 3,8 per

Table 13. Annual projected job losses by sector (in thousand workers).

	2000			2005				
	Direct losses	Indirect losses	Total loss	Livelihoods	Direct losses	Indirect losses	Total loss	Livelihoods
Gold	109	272.5	381.5	1 907.5	166	415	581	2905
Copper	1	3	4	20	2	6	8	40
Platinum group	7	18	25	125	16	39	55	275
Chromite	1	3	4	20	2	6	8	40
Other sectors	18	46	64	320	39	98	138	690
Total	136	342.5	478.5	2 392.5	226	564	790	3 950

Table 14. Demographics of mineworker employment 1994.

Province	Employees		Remuneration	
	number	per cent	ZAR billion	per cent
North West	174 920	28.7	3.6	26.6
Gauteng	154 163	25.3	3.1	22.6
Free State	129 247	21.2	2.5	18.6
Mpumalanga	73 351	12.0	2.1	15.5
Northern Province	39 304	6.4	1.1	8.2
Northern Cape	22 315	3.7	0.7	5.1
KwaZulu-Natal	1 3842	2.3	0.4	2.9
Western Cape	2 080	0.3	0.04	0.3
Eastern Cape	1 072	0.2	0.02	0.1
Total	610 294		13.6	

Source: Minerals Bureau.

cent . In other words, despite the ongoing reforms in mine labour practice, the average mineworker is only marginally better off than he was ten years ago.

In terms of the role that the industry as a whole has played as an employer, while in 1985 the industry employed 7,5 per cent of the country's economically active population, by 1994 this had dropped by 42,7 per cent to 4,3 per cent .

Socio-economic impacts

Generally, the attention given to retrenchments focuses on the jobs lost. The problem extends however to the attendant livelihoods that are lost as a result of the retrenchments. There are estimates of between 7 and 11 dependants per worker, so a conservative estimate of 4 dependants per worker is not unreasonable. (The 1991 census indicated a national dependency ratio of 2,3:1, but observation does not bear this out. It must be taken into consideration that these dependency figures exclude pensioners, who are to a great extent dependent on wage earners despite bringing money into households). This means in effect that for every 100 workers retrenched, 500 livelihoods are lost. Using this factor, the potential job losses of 109 000 by the year 2000 in the gold mining industry alone means the loss of 545 000 livelihoods of mineworkers and their dependants.

Table 13 indicates that if these ratios are accepted (2,5 first and second order

indirect jobs for every first order direct job and four dependants and partial dependants per worker), in excess of two million livelihoods will be affected (not necessarily deprived) by the end of the decade, and almost four million by 2005. The implications for poverty, crime and political responsibility for this are huge.

Insufficient is known about the broader linkages of the minerals sector into either the economy of the other sectors or those of the fabric of the country's society, the sub-regional and regional economics, the physical environment, and land-use options. It is critical that these be well understood in order to plan for economic development around the mines. It is also important to understand the linkages in order to avoid dependence on the mining industry that in the long run would be detrimental to the economic health of the country. The irony of the South African industry is that, because of the high levels of migrancy that typify the work-force, the effects of downscaling are frequently felt in areas other than the mining areas themselves. This 'out of sight, out of mind' syndrome is serious, as it means that the areas that will have to bear the brunt of retrenchments have little or no idea of the extent problems facing them. It thus becomes impossible for them to plan for the eventualities.

It is not the mining companies' responsibility to take up these issues. It is that of

the authorities at various levels of government to manage this process. However, these authorities have neither the information nor the skills in most instances to handle the problem at an industry-specific level. Assistance from industry to get to grips with the specifics of chronology of production cutbacks, and the chronology and demography of retrenchments is essential to the success of any socio-economic planning initiative around downscaling. Mining companies can establish the feeder areas for their labour, and can effectively establish when workers are likely to be retrenched.

Table 14 shows the demographics of employment by province, while Table 4 shows the demographics of origin at a national level.

Environmental Impacts

Few policy makers fully understand the implications of mine closures. It is an irony that, while the environmental lobby sees the mining industry as anathema, the environmental implications of mine closure at a broader geographic level can be far greater than the damage caused by mining activity at a local level.

The figures presented in Section 6 have serious environmental implications. Even assuming that they were 50 per cent out and, further, that half of the retrenched workers were miraculously re-employed in other sectors as a result of economic growth, this would still mean that by the end of the century 500 000 people who are currently dependent on the mining industry for their livelihood will be without a livelihood, and one million people by the year 2005. These people will have no option but to resort to a subsistence existence of some sort or another. As most mineworkers and many industrial workers come from rural environments, this will lead inevitably to some level of subsistence farming for total or partial survival. It also implies an inability to afford electricity, gas or paraffin as a source of household fuel, which will lead to further pressure on scarce fuelwood resources.

The quest for living space, lands for crop farming, and foraging for wood for domestic fuel must lead to massive deforestation of rural areas. Considering that for basic subsistence needs, a family of four needs a minimum of 200 goats or sheep, or 20-40 head of cattle, if only half of the workers returning to the rural areas resort to stock farming, with a balance of small livestock and cattle, this would indicate a population increase of some 6 million goats and sheep, and around a million cattle by the end of the century, and four times these numbers by 2005.

Any person who has travelled through the rural areas such as Transkei, Gazankulu, Venda, and Lebowa cannot have failed to notice the massive overgrazing already occurring in these areas. Most rural areas not under white commercial farms tend to be at carrying capacity for livestock or badly overgrazed. The prospect of a massive population increase of livestock due to downscaling of mines can only add to this already significant pressure on vegetation. Coupled with deforestation, the potential for rapidly increasing desertification in Southern Africa is too great to be ignored. The environmental damage caused by mining may well pale into insignificance when compared to that caused by mine closures.

Planning for economic alternatives on mine closure

In planning for the development of the minerals industry, planners should plan simultaneously for the optimal use, and ultimate conversion of the infrastructure created by mines, as well as the progressive accommodation of retrenched mine-workers as the mines close down. Such planning will entail having a strategy in place at the outset for alternative economic options that will ultimately replace the mines in terms of both employment and economic contribution. In effect, this process calls for economic closure planning for the mines similar to that currently undertaken for environmental rehabilitation.

It is recognised that ultimate responsibility for social and economic planning rests with the various levels of government. Mining companies have a primary responsibility to their shareholders and employees that demands a profitable operation in which input cost must be minimised. However, the companies have to take responsibility, and enforced economic closure planning will ensure that both the mining companies and the government agencies form a partnership in this planning process that will hopefully result in an ordered and constructive downscaling programme. It should also ensure that in the case of new mines, the infrastructure is planned at the outset with economic alternatives in mind. This must ultimately benefit the mining companies in the sense that at the end of the life of the mine, where possible, the infrastructure and real estate have some residual value.

Conclusion

The problems around downscaling of the minerals industry are real, and the predictions gloomy. However, it is preferable to have the problem of a minerals industry in decline than have no minerals industry at all. As discussed in this paper, the major advantage of minerals projects is that they create infrastructure and capital, and it is here that judicious planning is important: planning as to the manner in which the benefits of the minerals industry can be harnessed to provide for more sustainable economic alternatives is crucial.

In order to do this, it is vital that there is a fundamental understanding of how the minerals industry both within and without the province (migrant labour, mining timber grown in the province for mines outside the province) relate to the other economic sectors. As importantly, the linkages into the societal fabric and socio-economic structures at sub-regional and regional levels is of paramount importance in assessing the implications for environment and land-use planning of either a minerals devel-

opment or the downscaling of a minerals project.

Once the linkages and the inter-relational dynamics are understood, it is possible to assess projected movements in the industry and their implications for society and environment. Only then is it possible to assess the implications for other sectors, which in turn can be built into their respective sectoral strategies.

Any economic planning exercise that the country undertakes with respect to its minerals industry must be fundamentally based on these linkages. Without this understanding, not only will optimal exploitation be compromised, but the likelihood of economic, social and environmental havoc caused by mine closures will be greatly increased.

Notes

This paper presented at the AIC Conference, Finance and Investment in African Mining, held at Mintek, Johannesburg, 27-28 August 1996.

1. Published by Mining Journal Books, 1996.
2. Peter Rhode, *Major Challenges for Mining and Mineral Processing at the End of the Twentieth Century*.
3. John M Wilson, *The Role of Mining in an Evolving World*.
4. *ibid*.
5. Gregory, FH and Slack PA, *What does Africa have to Offer the World Mining Market? An Investor Perspective*, AIC Conference on Finance and Investment in African Mining, August 1996.
6. *ibid*.
7. Ex-Minerals and Energy Minister Botha in a written reply to a question in parliament, 21 February 1996.
8. Currency, retrenchment patterns, lack of consideration of new projects such as Moab, Target and Sun.
9. The figures were prepared for the Minister by the Geosciences Council.
10. O'Okiep mine management presentation to the Namaqualand Mining Summit, April 1996.
11. On mine payroll.
12. Suppliers of goods and services.
13. Civil service, tertiary commerce, trade and industry. ■