AREA REPORT

Outlook for South African base metals industry

by Stephen Briggs

This paper reviews the current state of the base metals producing industry of South Africa and outlines its importance in the world context. It discusses possible future developments. Finally it indicates how the role of base metals may evolve in the medium- and long-term future.

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Precisely which metals are encompassed by the term 'base metals' appears to have become blurred in recent years. In this paper it is chosen to follow the traditional definition comprising copper, lead, zinc and tin, the last of which is no longer produced in South Africa. Nickel is covered only where it is associated with the others. This narrow selection is used so as to avoid encroaching on the territory of other papers, rather than to reduce our workload!

Overview of South African mining – specifically base metals

It is perhaps worth at the outset making one or two broad observations about the mining industry of South Africa, since there may be some misconceptions about its relative importance. The first graph illustrates that mining and quarrying actually accounted for less than 8 per cent of the country's GDP last year. Furthermore, although its contribution has declined over time, the second graph shows that its share has rarely been more than 15 per cent over the past two decades. 1979–80 was exceptional and chiefly reflected very high gold prices.

Gold remains the single most important sector of South Africa's mining industry, but its contribution to the total value of mineral sales has fallen from over 60 per cent in the early 1980s to 41 per cent by 1995. The third graph illustrates that coal and platinum group metals take second and third place today, and it is the latter which has grown fastest over the years. (The two key constituents of the "Other" category are diamonds and titania minerals).

More germane to the present paper is that, even if nickel is included, base metals account for only 5 per cent of overall mineral sales, albeit this is up from 3 per cent in the early 1980s. One implication, then, is that the base metals mining industry represents less than 0.5 per cent of South Africa's economy. Furthermore, a number of mines have closed in recent years, including, notably, Prieska's Copperton (copper/zinc) in 1990, Messina (copper) in 1992 and Rooiberg (tin) in 1993. Last year, the country's share of world mine production was around 2 per cent in the case of copper, 3 per cent for lead and 1 per cent for zinc. At the refined level, South Africa accounted for roughly 1 per cent in each case.

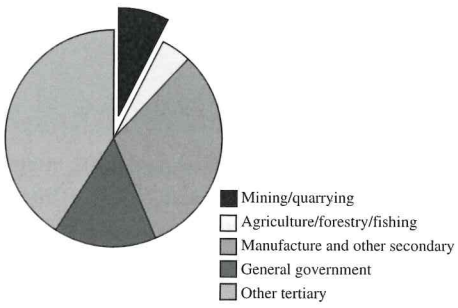
South Africa's base metal operations

Clearly, therefore, South Africa's base metals industry is nowhere near as important, domestically or globally, as its precious metals, ferro-alloys or coal industries. Nonetheless, it is worthy of discussion for two main reasons. First, the sector includes a couple of world-class operations, and, secondly, a few interesting developments may lie ahead.

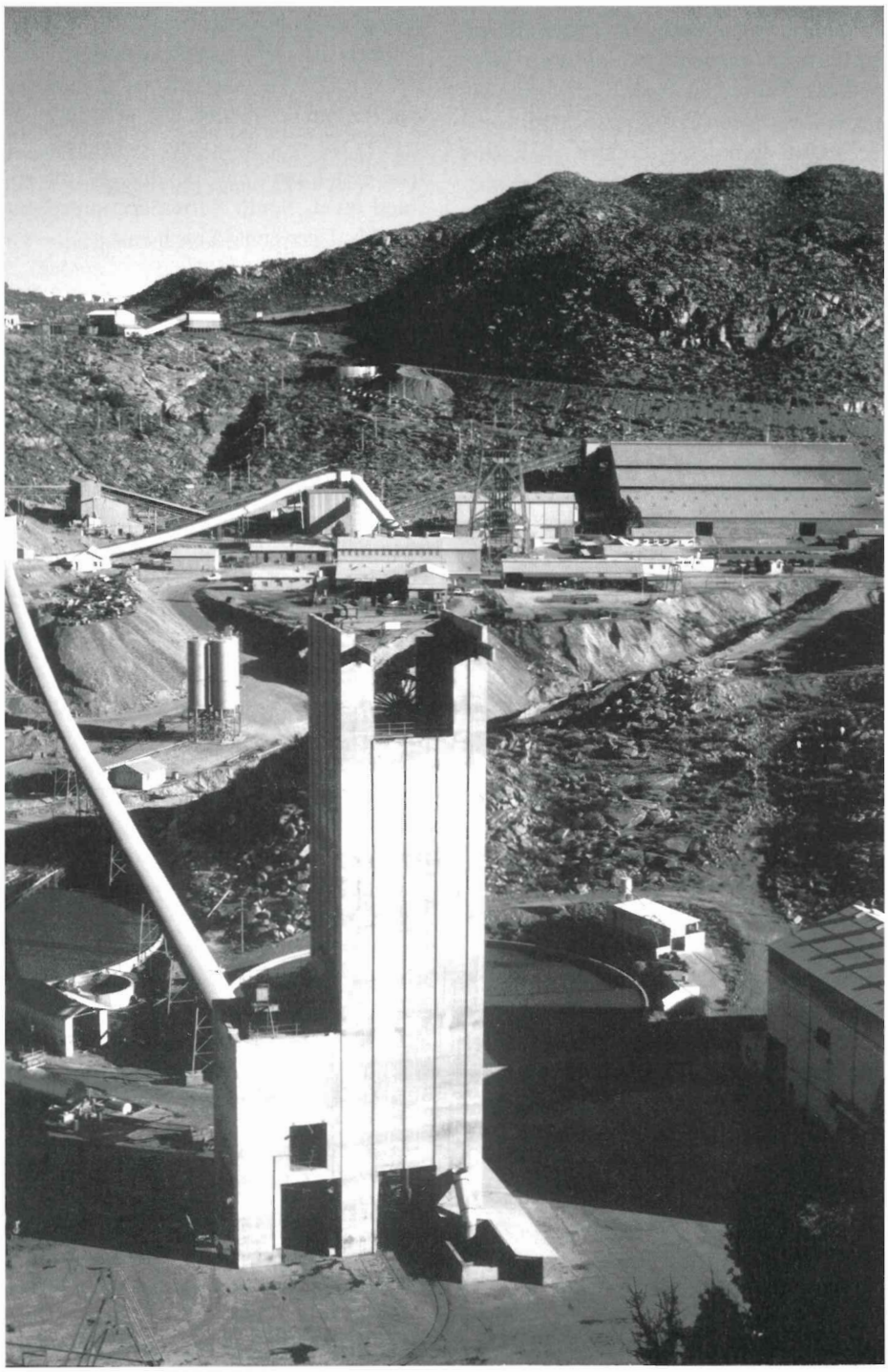
Palabora

The first table lists contributors to the country's 1995 base metal mining industry. By far the largest is the open-pit operation of Palabora Mining Company (38.9 per cent RTZ and 19.1 per cent Anglo American) which last year produced a record 141 700 t of copper in concentrates. Even before 1995s peak, though, the company had been forced to sell a portion of its concentrates internationally since the integrated smelter/refinery has recently been unable to exceed 120 000 t/y, and in 1995 sales amounted to 11 000 t contained copper. Byproducts include

Figure 1. South African gross dometic product 1995, by sector

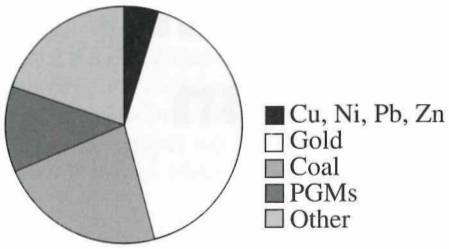


Source: South African Reserve Bank.



O'okiep Copper consists of two underground mines (Carolusberg and Nigramoep) and a smelter at Nabakeep.

Figure 2. South African mineral sales 1995, by commodity



Source: South African Reserve Bank.

vermiculite, baddeleyite, uranium, magnetite and, from the smelting/ refining process, sulphuric acid, precious metals and nickel sulphate.

Despite an average ore grade of below 0.6 per cent and smelter problems, the company reported net cash costs of production last year of just 0.42 USc/lb, an operating profit of over 700 MZAR (nearly 200 MUSD), and distributable profits of almost 390 MZAR. As an aside, the comparable figures for South Africa's entire gold industry were only about 3 700 MZAR and 800 MZAR. This year more smelting difficulties have been experienced but mine operating factors and especially the slump of the rand will have lowered dollar costs significantly, pushing Palabora further into the lowest quartile of world copper production.

Until quite recently the Palabora pit also afforded the production of up to 15 000 t/y of copper in concentrates to the account of state-owned Foskor which holds the rights to phosphorus-containing minerals in the orebody. This has, however, now virtually ceased.

It has long been known that Palabora's open-pit life is just to the year 2002, so it was tremendous news when the company was able finally in March 1996 to announce the go-ahead of a R 1 500 MZAR investment to develop an underground mine. Large-scale work got under way in mid-year and first production should coincide with the closure of the open pit.

After exploring various options, PMC has settled on block caving which will restrict net cash operating costs to an estimated just 0.50 USD/lb in real terms. This is based on production of 30 000 t/d ore and over 90 000 t/y copper with a life of 20 years. Probably all assumed parameters are conservative and that output in particular could turn out appreciably higher. Any need for purchased concentrates to allow the smelter to operate at full capacity may hence be quite limited.

Palabora will thus remain a world-class mine for at least another 25 years. Various infrastructure programmes in the area, in particular on the Maputo corridor, could give the company new options, notably on the productive use of its large stockpile of magnetite.

Gold fields

The rest of South Africa's base metals industry is dominated by three companies in the Gold Fields stable. The least satisfactory is the partially integrated operation of O'okiep Copper (68 per cent GFSA) which consists of two underground mines (Carolusberg and Nigramoep) and a smelter (but no refinery) at Nababeep. The mines produced a combined improved 26 300 t of copper in concentrates in calendar 1995 but a variety of problems have led to output falling back heavily this year to less than 90 per cent of design throughput. The smelter is old and small by world standards, and is forced to purchase concentrates (from Otjihase in Namibia and Maranda). 1995 blister production was 26 900 t, all for export. O'okiep has reported operating losses in each of the last three quarters and the total cumulatively for the 12 months to September 1996 was 12 MZAR on sales of 220 MZAR.

Gold Fields is trying hard to address O'okiep problems but at present the outlook can scarcely be described as rosy. Things have been made worse by the closure since August of Otjihase and the other Gold Fields Namibia operations. Current reserves are sufficient for eight years life and in the case of Carolusberg no extension is likely.

Black Mountain (55 per cent GFSA, 45 per cent Phelps Dodge) runs a much more robust custom lead/zinc/copper/silver mine near Aggenys in the Northern Cape. Calendar 1995 output was a little lower than in the two previous years but, thanks partly to good prices, especially for lead, operating profit for the 12 months to September 1996, on turnover of 305 MZAR , was a healthy 108 MZAR.

Figure 3. South African mining and quarrying as per cent of gross domestic product, 1975–1995

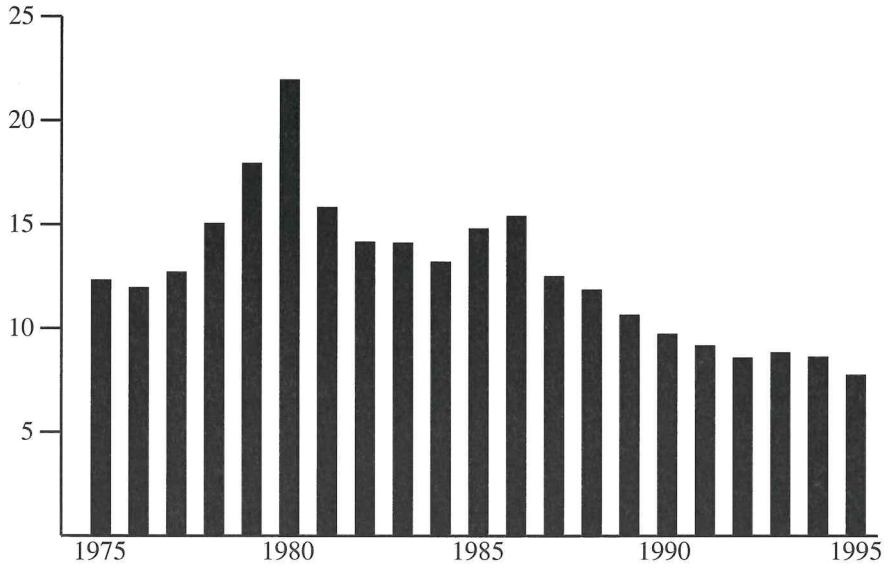


Table 1. South African base metal mine production, 1995 (kt metal-in-concentrate)

Mine	Operator	Copper	Lead	Zinc
Palabora	PMC (RTZ)	142	–	–
Black Mountain	GFSA	5	84	33
Pering	Gencor	–	4	28
Carolusberg/ Nigramoep	O'okiep (GFSA)	26	–	–
Platinum mines	Various	24	–	–
Maranda	Metorex	1	–	13
Palabora	Foskor	neg.	–	–
Total		198	88	74

There is no doubt that the operation is a valued asset for Gold Fields.

As far as the outside world is concerned, though, its import lies in the fact that Black Mountain is one of the largest custom lead mines, providing over 80 000 t/y of metal in concentrates to smelters in Europe and Japan. It is believed to be capable of continuing to do so for roughly another eight years from the currently exploited orebody.

The nearby Swartberg deposit is under pre-feasibility study and the company appears reasonably confident that this will extend life for a further decade.

Black Mountain's zinc concentrates, by contrast, remain within South Africa (like lead, its copper is exported) to provide 30–35 per cent of the feed for the custom electrolytic zinc refinery of Zinc Corporation (Zincor, 45 per cent GFSA) on the East Rand. The latter has been operating very close to its 100 000 t/y capacity (plus 130 000 t/y of sulphuric acid) for two years now and this helped it to record a respectable operating profit of 72 MZAR on turnover of 440 MZAR in the 12 months to September 1996, despite indifferent zinc prices.

The plant's three other feed sources are outside the Gold Fields group. The largest, accounting for a third of input, is Rosh Pinah in Namibia. Ownership here has been in dispute for some time, but likeliest outcome would seem to be a transfer to Western Metals of Australia with Iscor taking shares in the latter in exchange. Reserves are extensive and a major expansion is possible. Pering and Maranda (which are discussed further below) generally send all their zinc concentrates to Zincor, and represent the remaining 25–30 per cent and 10–15 per cent respectively of its feed.

The relatively limited life of the last two is one of the factors which has required Gold Fields to study a number of options for Zincor's long-term future. Since this may be bound up with prospects for the development of Gamsberg, the two are discussed together below.

Others

The Pering zinc/lead mine in the Northern Cape became 100 per cent owned by Gencor as part of the take-over of Billiton. The operation is low grade (2.5 per cent zinc) but is open pit and has been profitable despite disappointing zinc prices. Capacity production is 30 000 t/y zinc and 6 000 t/y lead, with the former, as mentioned, sold to Zincor and the latter exported. Reserves should last until about 2003, although they could be extended a couple of years.

The Maranda mine in the Northern Province is South Africa's newest base metal operation, having been commissioned in 1991. Operated and 26 per cent owned by Metorex, it is now capable of producing 15 000 t of zinc in concentrates (sold to Zincor) and 1 500 t of copper (sent to O'okiep). The company is confident that, including nearby orebodies, operations can continue until at least 2005. Metorex also now owns the inactive Rooiberg tin mine but, after re-evaluation, permanent closure and rehabilitation is in progress.

Worthy of brief mention, finally, are South Africa's platinum operations. Although very much of by-product status, up to 25 000 t/y of copper are now produced right through to the refined stage by the four groups combined. Amplats accounts for nearly a half and it is perhaps the most likely to expand in future, but only as the platinum market dictates.

Greenfield projects

South Africa has yet to develop a dynamic junior exploration/mining company sector like those of Australia and Canada, while the larger firms are busier exploring abroad than domestically. These facts partly explain the dearth of potential greenfield base metal mines. There are, fortunately, now a few encouraging signs for the future. One is the recent start-up of Barbrook by Caledonia Mining of Canada, albeit this is a gold mine. Another is the proposed sale by JCI of a number of its smaller, undeveloped mineral rights, which include base metals. More generally, the South African Government appears keen to promote small-scale mining and junior companies, partly through the non-governmental Minerals and Energy Policy Centre. Progress will, however, likely be slow.

As far as we are aware, only one new mine is committed, and so far this is small. Led by Anglovaal, a decision was taken in March 1996 to develop at a cost of 140 MZAR part of the Nkomati deposits at Slaaihoek/Uitkomst in Mpumalanga province. The high grade 'Massive Sulphide Body' contains reserves of 3 million t grading 2.04 per cent nickel, 1.13 per cent copper, plus cobalt and precious metals. Production is due to start early in 1997 at a target rate of 10 000 t/m of ore which will result in less than 1 500 t/y of copper (and 2 500 t/y nickel) in complex concentrates (which will be toll smelted/refined). Life is 15 years.

As the mine reaches capacity in mid-1997 a feasibility study on a much larger operation encompassing other areas of the Nkomati joint venture should be completed. It is too early to judge the likely outcome here, although the signs are promising, but even this would produce little more than 10 000 t/y of by-product copper.

Table 2. South African base metal refined production, 1995 (kt metal-in-concentrate)

Refinery	Oeprator	Copper	Lead	Zinc
Palabora	PMC (RTZ)	116	–	–
Vogelstruisbult	Zincor (GFSA)	–	–	99
Secondary plants	Various	–	32	–
Rustenburg	RPM	11	–	–
Springs/Marikana/Northam	Implats/Lonrho/Northam	12	–	–
Total		139	32	99

The Palabora mine is the largest open pit operation of South Africa.

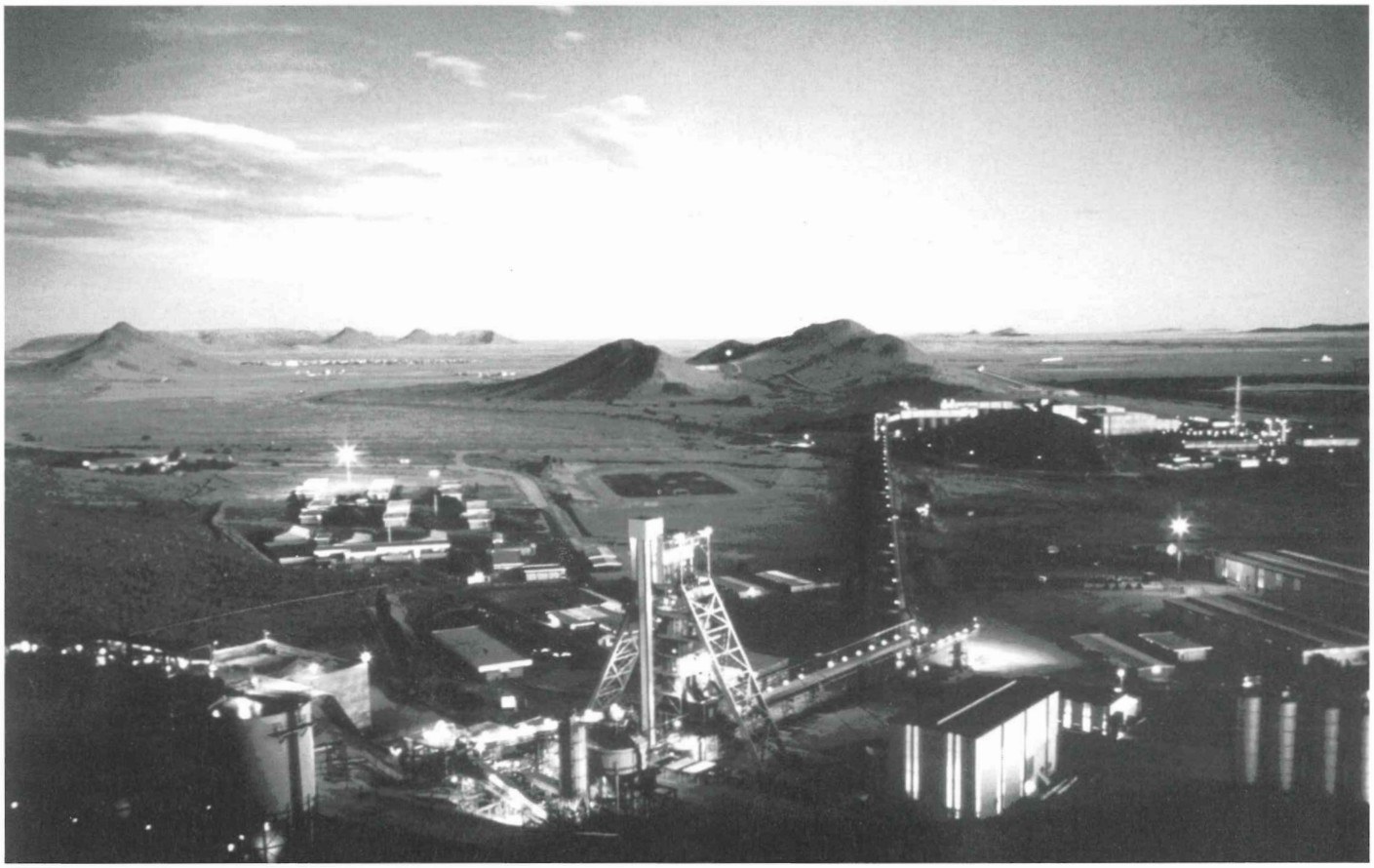
Nickel and copper are also the reported targets of an joint exploration programme in the Eastern Cape province involving Falconbridge, Gencor and Randgold. However, having only got off the ground in recent months, there is little yet to report.

Much better known is Gamsberg in the Northern Cape (very close to Black Mountain) controlled by Gold Fields. A resource of 160 million t with 7 per cent zinc and a little under 1 per cent lead (within a larger orebody) has long been established. Although grades are far from spectacular, the chief problem has always been the high manganese content which would, with current technology, report to the zinc concentrates and attract penalties in the custom market. The company does not appear to be advancing the project rapidly at present, but the favoured among many options seems to be development alongside a dedicated pyrometallurgical zinc smelter with capacity of perhaps 200 000 t/y. This could still leave concentrates for sale, but that problem might be manageable. An alternative could be the expansion and conversion to pyrometallurgical technology of the existing Zincor smelter.

It should be stressed, though, that Gamsberg does not appear to us to be at the top of Gold Fields' list of priorities, and ultimately it is probably a marginal project. Meanwhile, Zincor's own future must also be looked at independently since, as things stand, it will have to start importing perhaps a third of its concentrate feed within 10 years. In fact, however, given its location relative to current 'local' suppliers this may not be a great disadvantage; the Natal ports are actually closer. Indeed, the company is already considering an expansion, and may even look at a conversion to pyrometallurgy, irrespective of Gamsberg, partly to enable it to treat its large residue stockpile. The options in Gold Fields' zinc business are thus numerous, although decisions are not anticipated imminently.

More straightforward is Gencor's current investigation of a custom electrolytic zinc refinery in the Eastern Cape. Although three sites, two near Port Elizabeth and one at East London, are still under consideration, the appraisal is a full feasibility study. The company expects to have identified the favoured site by very early 1997 and to have completed the study before the end of the first quarter. Preliminary pa-

Black Mountain mines producing lead, zinc, copper and silver.



rameters are a plant with capacity of 220 000 t/y, importing most feed – Gamsberg is not a factor – and exporting most metal, at a capital cost of 400 MUSD. If a go-ahead is given, construction would start in mid-1997 with completion at the end of 1999. It is plausible to argue that the world will need new refineries by then, but whether South Africa is an ideal location is another matter. Much will no doubt depend on the level of power charges Gencor can negotiate. A subjective judgement is that the project is not a top priority for the company.

Conclusions

Although there are a number of unknowns, the above discussion, regrettably, scarcely describes a dynamic and growing industry.

As far as copper is concerned, for example, the South African mining industry could by the year 2000 be up to 5 per cent bigger than last year but its share of the world total will be static to down, while by 2005 it will likely have shrunk sharply to a size not seen for many years unless entirely new projects soon emerge.

Potentially, the outlook over the next 10 years for lead mining is equally uninspiring and zinc considerably worse. Only Gamsberg can reverse the decline, and we are far from convinced that this will see the light of day. So shortly before to the company's decision it would be rash of us to predict the outcome of Gencor's zinc refinery study. A go-ahead could, though, at a stroke (in the absence of Gamsberg or if this were integrated) shift South Africa, still one of the world's largest mining nations, from being a net supplier of base metal concentrates to a net buyer by early in the coming decade.

Note

This paper was originally presented att Metal Bulletin's 2nd Southern African Mining & Metals Conference, Johannesburg, 8th–10th December 1996. ■