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MINING AND PEOPLE

The impact of mining on the South African economy and living standards

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showing a drill jumbo used in
South Deep's mechanised underground operations.

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INTRODUCTION AND SYNOPSIS

There are two ways of looking at mining in South Africa. The first is to see it as a sunset industry plagued by rising costs, technical difficulties, and political hostility. The second is to see it as an industry well positioned for a new lease of life despite all the vicissitudes. Even though the attractiveness of South Africa for mining investment has declined, the country still has the world's richest reserves of precious minerals and base metals. Companies both large and small would like to exploit these. Some are doing so despite the political threats. Even more will do so if the threats can be effectively managed or reduced. According to the Chamber of Mines, investment over the next few years could almost double in the absence of threats.

Mining has helped to shape South Africa to a greater extent than any other industry. It turned a largely pastoral economy into an industrial one. It led to the establishment of Kimberley and Johannesburg and other towns. It attracted vast quantities of foreign capital. It necessitated the establishment of stock markets, universities, and other modern institutions. It required the development of very high levels of skill to exploit thin seams of gold up to four kilometres (nearly two and a half miles) below the surface of the earth. It helped to shape the country's labour market. It drew huge numbers of South Africans from subsistence economies into paid employment. It attracted hundreds of thousands of workers from neighbouring states into employment in South Africa. But it also left a legacy which includes disease, environmental damage, and political hostility.

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Mining is indeed a unique industry. Unlike others – banking or retail or construction or health care – where industry goes to where people are, the location of mines is dictated by where the minerals are. Mining companies in South Africa had to set up shop on the veld. They had not only to establish mining operations, but also to build townships and hospitals and all the other amenities required by their employees. Roads and railways and other infrastructure had also to be built, sometimes in neighbouring countries. South African mining companies established the world's first workmen's compensation fund. They also put up most of the money to establish the South African Institute for Medical Research. Mining in short inspired the development not only of technical sciences but also of human sciences.

Although the mining sector no longer dominates the South African economy as it once did, mining accounts for a major proportion of the country's earnings of foreign exchange. The economies of four of the nine provinces and of several large towns are dominated by mining, as is the port of Richards Bay. Coal is the source of nine tenths of South Africa's electricity, with the result that every other sector of the economy is heavily dependent on coal mining. So are the more than 15 million households connected to the national electricity grid owned by Eskom. Purchases by the mining industry of everything from boots to heavy machinery to rail services account for almost as much as the industry itself generates in output.

Mine wages, once among the lowest in the country, are now among the highest. Wages account for some 40% of expenditure by the industry. In addition, over and above what they pay in royalties and tax, mining companies contribute to local communities, either voluntarily or in terms of statutory requirements. Although black mine labour is no longer subject to racial restrictions, the migratory labour system continues to operate for large numbers of miners in that they leave their families behind them in rural areas in South Africa or in neighbouring states. Remittances to these areas by absent miners are an important source of their income. Most of the shares of mining companies in South Africa belong to large institutional investors, including pension funds.

The impact of mining on living standards is not easy to measure. Rising real mine wages have not necessarily translated into higher standards of accommodation, as many miners may have chosen to remain in shacks and spend their higher earnings on things other than better housing, such as satellite television. Data on living standards broken down by economic sector or type of employment is not available. This paper therefore includes general data showing trends in living standards, on the assumption that this generalised data reflects trends among miners as well as wider trends. Given that mine wages are now among the highest in the country, mining families are almost certain to be among those whose "living standards measures" (LSMs) are higher now than was the case 10 years ago. Mining households are among those who have been able to buy movable assets such as motor vehicles. They are also certain to be among those who have purchased cellular telephones. They are also sure to be among those who have seen HIV-prevalence rates start to decline. Various other indicators cited in this paper are designed to give some idea of the wider socio-economic trends that have affected miners and their families in one way or another.

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Since the mining industry contributes to national revenues via royalties and corporate taxes, along with personal taxes and various types of indirect tax, the paper includes data on public expenditure from which mining families will have benefited, including the provision of child support grants. Social grants have helped to push up household incomes in both rural and urban areas.

This paper starts by showing the direct impact of mining on the economy. It then demonstrates the effect of mining on those working in that industry. Thereafter, it shows the indirect effects of mining on living standards in general. Finally, it looks at some of the possible future developments in the mining sector.

ECONOMIC IMPACT

Basic statistics

Although once dominant, mining and quarrying now account for only 8% of South African gross domestic product (GDP). Since the middle of the last century the relative contributions of agriculture and manufacturing have also shrunk, while those of other sectors have grown. Finance at 20% is now the biggest sector, followed by government at 17%.

Mining accounts for 11% of gross fixed capital formation, but also for 16% of all foreign direct investment in South Africa. The industry accounts for only 0.3% of corporate taxpayers, but they were responsible for 6% of tax assessed in 2014. Although mining employs almost half a million people, this is only 5% of the country's workforce. As we shall see later in this paper, however, some of these relatively low figures understate the sector's contribution to the economy. For example, mining currently accounts for a third of all merchandise exports.

The industry also spends almost as much on the purchase of goods and services from other sectors of the economy as it generates in its own output. The transportation of coal accounts for more than half of the business of Transnet Freight Rail. The fortunes of a number of larger towns are heavily dependent on those of platinum and coal mines. Rustenburg in North West province thus depends heavily on the platinum mines in the vicinity, while coal mines in Mpumalanga export through the huge bulk terminal at Richards Bay in the province of KwaZulu-Natal (KZN). Most of South Africa's power stations are also dependent on coal, the source of 91% of the electricity generated by Eskom. This means that most businesses in the country and around 90% of all households are in turn dependent on coal. Without the oil produced by Sasol from coal mined in both Mpumalanga and the Free State, the country's fuel import bill would be higher.

> *There are 35 large-scale gold mines operating in South Africa, while the country accounts for 11% of the world's gold reserves. South Africa also accounts for 96% of known global reserves of platinum group metals, and is the second largest palladium producer. South Africa is further the biggest producer of chromium and vanadium ores.*

According to the government, there are 35 large-scale gold mines operating in South Africa, while the country accounts for 11% of the world's gold reserves. South Africa also accounts for 96% of known global reserves of platinum group metals, and is the second largest palladium producer. South Africa is further the biggest producer of chromium and vanadium ores, and a leading supplier of their alloys. It is, in addition, a significant producer of iron and manganese ores. Ferrous metals are produced from 32 mines and 23 ferroalloy smelters.

There is only one significant copper producer, but there are 680 producers of industrial minerals, among them 153 producers of clays used in brick-making, along with salt and silica producers. Other minerals found in the country include uranium, silver, titanium, and zirconium. Although South Africa is also one of the world's largest coal miners, South Africa's first and oldest major mining company, De Beers (now 85% owned by Anglo American), no longer controls the world diamond trade.

Mineral sales

According to Statistics South Africa (Stats SA), local and foreign mineral sales in 2016 totalled almost R424 billion. Coal at 26% accounted for the largest single proportion of the total, followed by platinum group metals at almost 23%, gold at 18%, iron ore at 10%, diamonds and other non-metallic minerals at 6.7%, chromium ore at 4.2%, and manganese ore at 4.7%. The balance was accounted for mainly by copper, nickel, other metallic minerals, and building materials.

Mineral exports

In the last 20 years, the contribution of mining to commodity exports has varied from a high point of 44% in both 1996 and 2010, to a low of just above 31% in 2003, to 34% in 2015. The fluctuations are partly the result of fluctuations in commodity prices. Even when down to only a third of merchandise exports, mining exports are major earners of foreign exchange, so helping to finance a large proportion of the country's imports. Among South Africa's top ten commodity exports, minerals outstrip motor vehicles by a factor of 2.7 to 1.

Although mining per se accounts for only a third of merchandise exports, if secondary beneficiated products are taken into account, then 60% of export revenue is derived from this broader category, according to the government's National Development Plan (NDP), which was adopted in 2012.

According to the Chamber of Mines, mining exports in 2015 amounted to R320 billion. Of this total, 27% was accounted for by platinum, and 21% by gold, while iron ores and coal accounted for 16% each. Oil products accounted for 10%, chromium and manganese ores and concentrates about 5% each, the balance being taken up by titanium, precious metals, vanadium, copper and a few others.

Royalties and taxes

Figures produced by the minister of finance show that commodity prices have a major impact on mining corporate tax. In the 2008 tax year, for example, 574 mining companies were assessed between them for R26.3 billion in income tax. In the 2012 year, by contrast, 437 companies were assessed for a total of almost R13.0 billion in such tax. The figures for the following year show that R16.1 billion was assessed in mining company tax, mining companies accounting for only 0.3% of corporate taxpayers but 9.1% of all tax assessed, although the latter proportion dropped to 6.1% in 2015. The taxable income of mining companies dropped from R93.2 billion in 2008 to R10 billion in 2013. By 2015, as we shall see below, a large proportion of mining companies were running at a loss.

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The mining industry pays royalties as well as income taxes. Royalty payments in the last three tax years totalled R15.57 billion. The minister of finance has pointed out that mining also contributes significantly to personal income tax, in that R15.2 billion was collected from mine employees in pay-as-you-earn (PAYE) tax in 2013/14. Mining of course also contributes to VAT and other taxes, the minister said.

Distributions to stakeholders

According to a 2016 study by PricewaterhouseCoopers (PWC), which covered 31 mining companies between 2010 and 2016, employees and "funds reinvested in capital additions and acquisitions" accounted for the two biggest components of "value distributed". In the last three years, employees have accounted for the largest single share of distributed value at 37% - 38%. In the preceding four years, funds reinvested accounted for the largest slice, the highest proportion being 43% in 2010. Shareholder dividends were at a high of 20% in 2012, since declining to 3% in 2016. The share taken by government in the form of royalties and taxes paid by the mining companies and their employees was usually between 19% and 20%, dropping to 15% in 2016. "Borrowings" varied from 1% to 5%. The amount spent on community investments by the 31 companies, with an aggregate market capitalisation of R560 billion, was 1%, and sometimes less.

Figures for the three-year period 2013 to 2015 supplied by Sibanye (now Sibanye-Stillwater), a major gold and platinum producer, showed that employees, organised labour, and contractors accounted for 47% of how "value created has been shared". Suppliers, including suppliers of water and utilities, accounted for 32%. "Debt providers" accounted for 6%, while government's take in tax and royalties was 6% and the share of local government 2%. Some 4% was reinvested by the company, while shareholders received some 3.3%. Distribution to "communities" was 1%.

Companies are not always able to pay dividends, of course. Another major gold producer, Harmony, has paid shareholders only six times since 2004, while Cynthia Carroll, when she was chief executive of Anglo American, made herself very unpopular when in the midst of the global financial crisis she stopped paying dividends for the first time since the Second World War. In 2016, AngloGold Ashanti paid its first dividend since 2013.

Like other platinum miners, Lonmin, a major high-cost producer, has been struggling with low prices for years. Nearly a third of this company belongs to the Public Investment Corporation (PIC), which invests the pensions of public servants. Lonmin has not only failed to pay dividends in the last few years, but has had to go on its knees to shareholders three times in eight years for additional capital. It also shed almost 5 500 jobs. At the end of 2016 Lonmin reported a profit for the first time in years. However, its chief executive, Ben Magara, said that the long-term sustainability of the company was more important than paying dividends. According to the Chamber in its 125th report in 2015, 31% of gold mines and 40% of platinum mines were loss-making and would need further restructuring.

According to Roger Baxter, chief executive of the Chamber, total revenues of mining companies in 2016 amounted to R571 billion, of which R6 billion was paid out in dividends. In the end, it is clear, employees, suppliers, and the government get more money out of the mining industry than its shareholders do. Where funds are reinvested in the company rather than paid out in dividends, all stakeholders stand to benefit.

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Mine ownership

According to Mike Teke, immediate past president of the Chamber and now chief executive of Seriti Resources, a large coal mining company, it is a mistake to suggest that the mining sector is "white owned". "The great bulk of mining shares are owned not by individuals or their companies, but by huge financial institutions, including pension funds both local and foreign. These include the retirement and other savings of local people, black and white, and of others living all over the world. The vast bulk of shareholdings – probably more than 95%, particularly in respect of larger companies – are held by these institutions. The only significant exceptions are the entrepreneurs, employees and community trusts that have been participants in black economic empowerment transactions."

Some of the South African investments, Mr Teke said in May 2017, were held through institutions such as the Public Investment Corporation (PIC) and the Industrial Development Corporation (IDC) (both of which belong to the state). The bulk of the remainder were owned by foreign pension and other funds on whose investment dollars "we are dependent". None of the companies were owned or controlled by the mining magnates of old, "who exist only in the minds of those who are trying to sell, for mischievous ends, the notion of white monopoly capital".

Mr Baxter said that the PIC, which invests the pension funds of all government employees, owned 10% of mining equities. According to other reports, the state, through its control of the PIC and the IDC, owned 15.7% of local mining assets. With its 30% stake, the PIC was reported to be the largest shareholder in Lonmin, the company whose platinum mine at Marikana in the North West province was the scene of major violence in August 2012 in which 44 people were killed – 10 of them by mineworkers and 34 by the police. According to Mark Cutifani, chief executive of Anglo American, black South Africans own more than 45%

of the company's operating assets in the country if participation in pension funds and direct ownership are both taken into account.

Black economic empowerment

Mr Baxter said in June 2017 that the value of black economic empowerment (BEE) transactions put together by mining companies between 2000 and 2014 amounted to R205 billion. Mr Teke said that these schemes had so far delivered R159 billion in value to recipients – entrepreneurs, employees, and community trusts. Chamber figures show that R47 billion in dividends has been paid out to 7.1 million "historically disadvantaged South Africans".

The Chamber also disputed allegations in 2015 by the then minister of mineral resources, Ngoako Ramatlhodi, that black ownership of mining companies had fallen short of the requirements of the Mining Charter, the first version of which was introduced in 2004. Although the Charter stipulated a target of 26% black ownership, the industry said its members had reached an average empowerment level of 38%.

In September 2017, in an article marking the hundredth anniversary of the founding of Anglo American, Mr Cutifani said that the corporation had been instrumental in founding several BEE mining companies in the 1990s. These included Exxaro, African Rainbow Minerals (ARM), Shanduka, and Royal Bafokeng Platinum. JCI (formerly the Johannesburg Consolidated Investment Company), once under Anglo control, was the site of one of the earliest BEE deals.

Contribution to national, provincial, and local economic output

As we saw above, the relative contribution of mining and quarrying to national output as measured by GDP has dropped to only 8%. Although falls in commodity prices, rising costs, damaging policies, and strikes have caused the mining industry to be smaller than it might otherwise have been, the decline in its relative contribution over time is largely explained by the growth of other sectors as the South African economy has matured with the expansion of the secondary and tertiary sectors of the economy.

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Initially triggered by the needs of the mining industry, these other sectors have developed momentum of their own. In real terms, however, the output of the mining industry has shrunk 7.3% since its peak in 2005. This can be directly measured. What cannot be directly measured is the extent to which the decline of the mining industry has resulted in lower growth than might otherwise have been the case in other sectors of the economy, and therefore in the economy as a whole. Lower growth invariably means lower rates of job creation.

Despite its relatively small contribution to national output, mining accounts for the single largest proportion of the output of four of the nine provinces. Thanks in large part to iron ore, almost a fifth of the output of the Northern Cape comes from mining, while the dominance of coal in Mpumalanga ensures that almost a fifth of that province's output also comes from mining, although copper makes a contribution too. Limpopo, which contains diamonds, iron ore, and various other minerals, relies on mining for nearly 25% of its output. Largely because of platinum, the North West province relies on mining for almost 30% of its output.

Excluding Johannesburg, which was founded in 1886 and long ago diversified far beyond mining, six of South Africa's 16 largest towns measured by contribution to GDP are substantially dependent on mining. This includes not only platinum but also the mining of coal for the production of liquid fuel and electricity and the manufacture of various types of steel from iron ore mined in South Africa. These towns are: Rustenburg, Middelburg in Mpumalanga, Witbank, Secunda, Sasolburg, and Thabazimbi. They have some of the highest figures for GDP per head in the country. Many smaller towns also depend on mining, one example being Kathu, a town 40 kilometres from Kuruman in the Northern Cape. Just outside Kathu is the Sishen mine operated by Kumba Iron Ore, nearly 70% of which belongs to Anglo American.

Without mining, Kathu would probably not exist. Today it has free-standing houses, new shopping centres, churches, shops, a police station, a private hospital, and even a private school. The nearby Sishen airport offers flights to Johannesburg.

Several harbour towns outside the main mining provinces are also dependent on mineral exports. Apart from the coal railed from Mpumalanga, Richards Bay exports phosphate products, including fertiliser and phosphoric acid, produced either there or at Phalaborwa in Mpumalanga, on the western border of the Kruger National Park. The port, by far the largest in the country in terms of tonnage handled, ships around 30 different commodities right around the world. In addition, it is home to Richards Bay Minerals, a subsidiary of Rio Tinto producing the titanium dioxide that is used in white pigments and accounting for half the mining output of KZN.

Saldanha Bay in the Western Cape depends heavily on the export of iron ore produced mainly by Kumba and railed 861 kilometres from Sishen in the Northern Cape, one of the largest opencast mines in the world. In the Eastern Cape, the new port of Ngqura near Port Elizabeth is being extended to handle the export of manganese from the Kalahari field north of Hotazel in the Northern Cape, home of 80% of the world's known manganese ore reserves. Exports from the Kalahari field also necessitate extension of the railway from there to Ngqura, a distance of more than 1 000 kilometres. The bulk terminal at Matola in the harbour at Maputo in Mozambique also benefits from South African mineral exports, among them phosphate products and coal.

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When mines die, towns do as well. Perhaps the most striking example is Welkom, established by Anglo American to meet the needs of its Free State mines. In its heyday these mines produced 21% of the world's gold. Once declared a city, Welkom is now a shadow of its former self.

A similar fate would befall other towns if organisations hostile to the mining of coal were to have their way. The authors of a 2016 report entitled Destruction of the Highveld called for an end to coal mining in South Africa. If their call were to be heeded, the damage would go far beyond the direct jobs lost on coal mines and in coal-fired power stations in that part of the country. The ripple effects of these job losses would spread far beyond Eskom and the mining industry. The economies of Middelburg and Witbank would be dealt a severe blow as they would lose all the expenditure both of the nearby mines and of the mineworkers on a vast array of goods and services. The same would apply to smaller towns on the Highveld. Transnet would lay off workers in Ermelo and at all its railway sidings on the mines. No longer able to rely on coal mines, Sasol would stop producing liquid fuels and all its by-products. This global company would probably have very little reason to keep any operations in South Africa. The town of Secunda in Mpumalanga and nearly all its residents would be detrimentally affected.

But the ripple effects would spread beyond the province of Mpumalanga. Sasolburg in the Free State, the site of the country's first oil-from-coal plant, would suffer economic damage. Richards Bay would lose jobs across a wide range of industries. These would include all the employees at its coal terminal. But the ripple effects would go beyond the coal export harbour. There would, for example, be a drop in demand for air travel to Richards Bay, so some of the ground crew at its airport would also lose their jobs. The same would apply to chambermaids in the town's bed-and-breakfast establishments, along with jobs and businesses of all shapes and sizes. The whole town would be dealt a severe blow, which would in due course reduce it to not much more than a fishing village. Not only would the livelihood and living standards of many of its residents be damaged. The same would apply to residents of surrounding black townships.

Purchases

All of these figures and considerations nevertheless understate the importance of mining to the South African economy. In 2016, for example, according to the Chamber, mining contributed R291 billion to GDP directly, but spent R245 billion on purchases of goods and services from the other sectors of the economy. These purchases ranged from footwear through construction to business services. The largest single component was transport and storage; the second largest was petroleum chemicals, rubber, and plastic; the third largest was metals, machinery, and equipment; and the fourth largest was electricity, gas, and water. Of the total of R245 billion, R89 billion was for capital expenditure, leaving R156 billion for current spending.

While 52% of the expenditure of the mining industry went on transport, storage, and communication, this expenditure by the mines accounted for almost a third of all expenditure in that sector. A quarter of expenditure by mining was on manufacturing, but this expenditure accounted for nearly 13% of all expenditure on manufacturing. Electricity, gas, and water accounted for 7% of mining expenditure, but this expenditure by mining accounted for more than 12% of all expenditure on electricity, gas, and water.

All other sectors buy goods and services necessary for their own generation of output. But given the nature of the industry, mining arguably purchases a far wider range than other sectors. The very process of digging minerals out of the ground requires enormous expenditure on goods and services of a kind not required in other sectors. An idea of the vast array of goods and services required by mining emerges from the fact that Anglo American has 30 000 suppliers around the world.

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To give an idea of how large the sum of R245 billion is, it is worth comparing it with the government's own expenditure. The budget for current spending by central government on goods and services in 2015/2016 was R188 billion (against the mining industry's figure of R156 billion). Total comparable expenditure by all the municipalities in the country in 2015/2016 was R169 billion. Total public infrastructure spending by all three levels of government and state-owned companies was budgeted in that same year at R290 billion (against the R89 billion in capital expenditure by the mining industry alone).

Other sectors

According to a paper produced in 2015 by Henk Langenhoven, then chief economist of the Steel and Engineering Industries Federation of Southern Africa (Seifsa) and now chief economist of the Chamber of Mines, the metals and engineering sector is "intimately linked" to the fortunes of mining, construction, and the auto sector. All four were driven by factors that included global growth, commodity prices, and "policy certainty".

The "commodity super cycle" had come to an end in 2011 after twelve years of price increases. Partly as a result, the metals and engineering sector had been in decline for three consecutive years, although loss of competitiveness and "a deluge of imports" had also contributed. A recovery in demand from the mining sector was now necessary to help recovery in the metals sector: "Without the mining sector set on a course for future growth, a large proportion of the metal and engineering sector's market will remain in the doldrums." This was because the domestic market for metals and engineering depended largely on products supplied to mining, construction, machinery and equipment manufacturers, and the auto sector. Between them these sectors contributed nearly 17% to national GDP, employed some 1.7 million people, and accounted for more than 60% of foreign exchange earnings.

Although the government said that the violence at Marikana in 2012 had not had a negative impact on the country's ability to attract investors, the manufacturing industry reported that weak mining production over the preceding 18 months had already eroded demand for locally manufactured goods. A spokesman for the Manufacturing Circle said that "South African manufacturing operates on the back of the mining sector". A few years later heavy construction was reported to be in a "deep funk" as a result of the absence of new projects in mining and public infrastructure.

Numerous companies across the country depend heavily on business in mining. Cummins Southern Africa, part of a global engine manufacturing company, said the mining industry was probably its most important market. Bell Equipment, one of the African continent's largest makers and distributors of heavy yellow metal vehicles, was reported in 2015 to have been "hard hit" by the slowdown in mining activity across the continent. AECI, the company founded to make dynamite for the South African mining industry, said in 2014 that it was planning to start producing in Australia in order to "de-risk our business from relying on the South African economy", where the domestic mining and manufacturing sectors remained stagnant. Many major South African construction companies have similarly looked for opportunities elsewhere in the world in order to reduce their dependence on South Africa, where many of them were major contractors to the mining industry for decades.

Although ministers repeatedly call for the revitalisation of the manufacturing sector, they appear to forget that one of the factors curtailing its growth is the decline of mining, in part because of policies whose effect is to discourage investment in the mining industry.

Skills and technology

Mining in South Africa has always required extremely high levels of skill in numerous different fields, ranging from metallurgy to shaft sinking, from ventilation to chemistry, from work that can be done by men and women in laboratories wearing white coats to more perilous work by men and women in overalls deep underground. The Chamber of Mines at one stage had more than 600 research staff on its payroll.

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John Lang, who for many years headed the public relations department at the Chamber, said that no auriferous conglomerates had been mined on a large industrial basis in any part of the world. South African mining would take human beings deeper into the Earth's crust than they had ever previously ventured. Engineers had to grope their way. This means that the men who dug the mines, and the companies set up to finance them, were among the world's leading pioneers.

The demands of the new industry not only necessitated the establishment of two universities, those of the Witwatersrand and Pretoria, but also helped to maintain high levels of intellectual expertise in higher education, as well as high levels of technical expertise in a range of other educational institutions. As one of South Africa's leading economic historians, Hobart Houghton noted, South African mining has always been an epic of applied science. Professor Chris Barnard put South African surgery on the global map with the world's first heart transplant in 1967, but South African mining engineering had long since already been on that map.

Numerous challenges have been overcome down the years. Among them were how to cool workplaces far below the surface of the earth, and, above ground, how to extract minerals from low-grade ore by chemical processes. Another great feat was taking only 31 days to sink a shaft as far below the surface as the Empire State Building rises above it (381 metres).

People think nothing of stepping into a lift and pressing a button that will take them within a minute or two to the top of the tallest buildings in the world. Yet the world's deepest gold mine, Mponeng (part of what was formerly Western Deep Levels) outside Carletonville in North West, is almost five times as deep as the world's tallest skyscraper, Burj Khalifa in Dubai, is tall.

Finding gold at these levels in the first place, sinking shafts, cooling rock faces, lowering thousands of men below the surface, and then bringing them safely back up again, and hauling thousands of tonnes of rock to the surface as a routine daily activity is a feat of enormous human ingenuity. None of this could have been achieved without the courage and vision of the so-called "randlords" who built the South African mining industry in an infrastructural and technical wilderness. Nor was it only mines that they built. Much else was also necessary. For example, when Anglo American opened up the Free State goldfields in the 1950s, it built the most modern hospital in Africa in Welkom for its black employees. Three other new hospitals were also built and handed over to the province in 1954.

Plenty of challenges remain. Mechanisation has long been talked about, but is extremely difficult to achieve. Almost 80% of the gold-mining industry's output still comes from workers who use hand drills in narrow tunnels, rather than the bulk mining techniques employed elsewhere. Gold Fields, which bought the South Deep mine in North West in 2007, has been struggling ever since then to make it profitable and to introduce fully mechanised production. It is able to use heavier machinery because its ore seams are wider than most others. With a reserve of 37 million ounces, the company plans to produce 500 000 ounces a year for the next 60 years. The chief executive, Nick Holland, said in 2015 that "the potential of driverless trucks underground is two to three years away". A notable feature of South Deep is a huge underground workshop – 2.7 km below the surface – where vehicles can be repaired without having to be hauled up to ground level.

> *Mponeng outside Carletonville in North West is almost five times as deep as the world's tallest skyscraper, Burj Khalifa in Dubai, is tall. Finding gold at these levels in the first place, sinking shafts, cooling rock faces, lowering thousands of men below the surface, and then bringing them safely back up again, and hauling thousands of tonnes of rock to the surface as a routine daily activity is a feat of enormous human ingenuity.*

Mechanisation has also been difficult to achieve at Lonmin. In 2004 the company embarked on an extensive mechanisation programme at a cost of R1 billion, but ran into difficulties four years later because of the narrow and deep ore body. The company thereafter tried to reverse the process, costing another R1 billion.

The Chamber told the writer in 2016 that South African mining had a technological lead in the use of "proximity detection systems" on trackless mobile machinery underground to avoid collisions and other accidents. Some mining companies are helping to finance research aimed at developing a transmitting device to be fitted into miners' helmets so that they can be located in the event of accidents such as that which occurred at the Lily mine in Barberton nearly two years ago when three miners trapped underground could not be found.

According to Allan Seccombe, a mining journalist, mining companies are spending about R1 billion a year on modernisation and research. This is partly designed to enable them to extract declining quantities of gold from greater and greater depths both successfully and safely. Peter Turner of Sibanye said in 2015 that there were still large quantities of gold that could never be mined economically using conventional labour-intensive methods.

Neal Froneman, chief executive of Sibanye, told the writer in 2016 that it was necessary to move away from blasting. Master Drilling, a company established in South Africa in 1986 which now has operations across the world, offers the mines increased safety and speed and lower costs through "raise boring" technology that enables mining to be undertaken without the use of explosives. Raise boring also makes round tunnels, which are more stable than those created by the blasting of stone. This reduces the risk of rock falls. It also enables mines to cut costs, as horizontal boring to reach ore bodies enables them to be reached in a third of the time it takes using drills and explosives.

According to the Chamber, raise boring is being tested on a number of gold mines in order to "remove people from the mining rock face". Techniques are being used in coal mines so that workers do not have to enter so far into tunnels; this will reduce the risk to miners from rock falls. Speaking at a "mining indaba" in Cape Town at the beginning of February 2017, Mr Cutifani of Anglo American said that his company was building a "modern mine" in which "continuous rock-cutting machines safely extract the targeted ore – deep underground – without the need for explosive blasting".

Master Drilling announced at the same indaba that it would soon complete a pilot project at the Cullinan mine, east of Pretoria, which produced the Cullinan Diamond and other famous gems. Previously known as the Premier Mine, the Cullinan mine was acquired by Petra Diamonds from De Beers in 2008. Master Drilling said that raise boring would not only eliminate the need for drill- and-blast mining, but also increase mining productivity thanks to its continuous process. There would be significant safety benefits as well.

Tony O'Neill, Anglo American's group technical director, told a conference in New York in May 2017 that the amount of water and energy used in mining was unsustainable. Innovation was necessary to target only the metal or mineral, with radically less waste, water, and energy, along with a smaller footprint. He told a conference in London in November 2017 that the company was planning to use computerised drills with "chiselling ability as good as a human" to increase productivity, cut costs, and reduce environmental impact.

In response to increasing demands by environmental lobbies and surrounding communities, some of them backed by public interest law firms willing to go to court, the coal-mining industry will need to apply science and technology to an ever-escalating list of challenges, including mitigating environmental damage and reducing water consumption. Another great challenge is of course that of safety.

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Since there are usually spin-offs from scientific advances in one field to other fields, South African mining companies will thus continue to make a major contribution to continued development of the country's intellectual capital. Although South Africa is slipping down numerous international tables ranking our performance in various fields with that of other countries, the continuing development of mining technology is helping to keep us in the top rank in that field.

Railways

The service industry most heavily dependent on mining is rail freight, in South Africa a monopoly in the form of Transnet Freight Rail (TFR), a division of the state-owned company Transnet (previously South African Transport Services and before that South African Railways and Harbours). TFR employs more than 31 000 people across the country. Apart from containers, motor vehicles, bulk agricultural commodities, and timber, TFR's trains convey the products of the country's mines either internally from mine to manufacturer or for export, not only abroad but also to neighbouring countries. In addition to coal, these include petroleum products; iron ore and manganese; steel, lime, and cement; non-ferrous metals, chrome and ferrochrome, rock phosphate, granite, magnetite, and hematite.

Coal alone accounts for 60% of the organisation's revenue. Eskom and companies supplying coal to its 16 coal-fired power stations are major customers, but so are companies exporting coal through Richards

Bay, Maputo, and Durban. Lobbyists seeking to stop coal mining in South Africa seem to overlook the likelihood that, if they were to succeed, half of TFR's employees would be among the many people who would lose their jobs.

Towns such as Ermelo in Mpumalanga play a key role in the coal export business. According to Transnet Freight Rail, Ermelo is its biggest marshalling yard, for it is there that trains from nearly 50 coal sidings at mines in the surrounding area are combined into 200-wagon trains for dispatch along the 580-kilometre railway line to the Richards Bay Coal Terminal for the export market.

The transport sector accounts for 10% of GDP, slightly more than the 8.4% accounted for by mining. Transport and logistics account for a third of the R1.16 billion envisaged in public sector infrastructure spending between 2015/2016 and 2017/2018. A large part of this expenditure is necessitated by the upgrading and extension of South Africa's rail and port services, necessitated in turn by the needs of the mineral export industries.

Coal

In South Africa in the 2015/2016 financial year, Eskom consumed about 119 million tonnes of coal, while some 75 million tonnes were exported. Although mining in general consumes only 14% of the electricity generated in South Africa, coal is the feedstock for 91% of our electricity. Via Sasol, it is also the basis of a third of our liquid fuels, mainly petrol and diesel. Apart from those feeding Sasol, coal mines employ nearly 90 000 people.

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Given that Eskom owns 15 coal-fired power stations, including two big new plants, Medupi and Kusile, due to come into full operation in the next few years, South Africa for the foreseeable future is locked into coal, of which it has enormous reserves. However, supply from the large collieries is drying up, so that substantial new investment in coal mining is needed for future supplies. A few years ago Eskom said that it needed ten new coal mines at a cost of R100 billion. But although several large local companies, among them Exxaro, have been making big investments in coal for both Eskom and the export market, this investment is not happening on the scale required.

One reason is that the government has proposed (though not yet imposed) price controls on coal supplied to Eskom. A second is the preference of both the government and Eskom for much more nuclear energy. A third is that coal suppliers are now required by Eskom to have at least 50% black ownership. A fourth is the requirements of the third version of the Mining Charter.

Although the export terminal at Richards Bay has enlarged its capacity, increases in coal exports depend critically on expanded rail capacity to accommodate more than the current two dozen trains running loads on behalf of three dozen customers every day. Most coal is exported from the mines in Mpumalanga. Export from the huge new coalfield in the Waterberg, which is farther to the north west in Limpopo, will depend on major extensions of the railway and other investment in that area. While the urban and industrial infrastructure for coal mining in Mpumalanga is largely in place, this is not so for the Waterberg, so that expansion of coal mining there would necessitate substantial industrial and other development, boosting living standards and generating jobs in that area.

By-products

Apart from generating demand for innumerable other goods and services, mining produces numerous by-products. One of course is uranium, a by-product of gold production. Among others are a whole range of plastics, including numerous plastics produced by Sasol as by-products of the manufacture of oil from coal. Prominent among these is polypropylene, one of the world's most commonly used plastics in both commercial and household applications. Sasol, which exports polypropylene to markets that include China, South America, Europe, the US, and the rest of Africa, commissioned a R1 billion polypropylene expansion project at Secunda in November 2016.

The figure of 8% direct contribution to GDP understates the importance of mining in other respects. Although mining itself accounts for only 11% of all gross fixed capital formation (GFCF), the mining industry's demand for other goods has an impact on levels of investment by other sectors.

Investment

The figure of 8% direct contribution to GDP understates the importance of mining in other respects. Although mining itself accounts for only 11% of all gross fixed capital formation (GFCF), the mining industry's demand for other goods has an impact on levels of investment by other sectors, especially manufacturing, whose own contribution to gross fixed capital formation is nearly 14%. Transnet, which depends on mining for a large part of its business, accounts for more than 7% of all fixed capital formation. The fortunes of mining also help determine levels of investment in the electricity sector. At the same time, of course, the capacity of the transport sector and the availability of electricity have an impact on investment decisions by the mining sector.

WIDER HISTORICAL IMPACT

Although this paper is focused on the current impact of the mining industry, no discussion of South African mining can avoid reference to the past. The industry was built on a migratory labour system, which, as we shall see below, endures to this day. Although both white and black miners were unionised from early on, only the former were included in wage and other negotiations until black unions were recognised in the 1970s. Down the years white unions strongly resisted attempts by mining companies to employ blacks in all but the most menial jobs. This was not only a denial of opportunity, but also helped to keep black wages down and perpetuate enormous inequalities in earnings as between black and white. The colour bar in mining employment was not only a question of practice, but was also imposed by legislation. John Lang of the Chamber wrote in Bullion Johannesburg, his monumental study of that institution, that "the colour bar was a cruel deprivation of the right to develop industrial skills and to earn a commensurate wage."

These historical factors – often referred to as "legacy issues"– help to explain the hostility to the mining industry that is apparent in the ruling party and in other organisations.

Jobs

As is the case with manufacturing, the number of people employed in the mining industry has dropped steadily. According to the Chamber, the industry employed more than 832 000 people in 1986. By 2017, this figure had dropped to 467 000. This represents only 5% of total employment in South Africa. The Chamber says, however, that "for every direct mining job, a further two indirect jobs are created in downstream and support industries". In addition, says the Chamber, one worker's income feeds ten other people, some of them staying with the miner, others surviving on his or her remittances. In effect, said the Chamber, the industry accounted for altogether 1.5 million jobs and supported - directly and indirectly – 15 million people.

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Asked for more precise figures, the Chamber said in 2016 year the number of indirect jobs accounted for by mining was 954 089, of which three quarters were in the tertiary sector, and the remainder in the secondary sector, with a handful in agriculture. On these figures, mining would account for employment of 1.44 million altogether.

Many communities, the Chamber argues, owe their existence to mining. As we have seen, four of the nine provinces are directly dependent on mining for the largest single slice of their economic output. Although mining accounts for only 0.2% of the output of the Eastern Cape, which has no mining activity, the incomes of people in the Eastern Cape depend to a greater extent on mining than this low figure suggests. This is because migrant workers resident in that province have always contributed a large proportion of the mining industry's workforce. Although the incidence of migratory labour has dropped substantially, 20% of African households in South Africa receive remittances from mining and other sectors. It may be assumed that many of these households are in the Eastern Cape and other former homelands. Neighbouring countries, in particular Lesotho, rely heavily on income earned by migrant workers on South African mines.

When he was still president of the Chamber, Mr Teke said that "historically disadvantaged South Africans" now occupied more than 40% of senior management positions and more than 50% in other management categories in the mining industry. They also occupied 75% of core skilled jobs.

Despite the antipathy towards mining frequently voiced in the ruling party, ANC officials sometimes seem to regret job losses, especially, it appears, when these might arise from disinvestment by mining companies. Following an announcement in 2014 by Anglo Platinum that it was considering reducing its dependence on that metal (which it did by selling its Rustenburg mines to Sibanye), Jessie Duarte, deputy secretary general of the ANC, said, “Lost employment in the mining industry, considering the low skills base of labour it employs, translates into a further burden on the country’s social wage. It adds to the depression in the labour-sending areas that are already destitute.”

Wages

Down the years the mining industry, and gold mining in particular, has been criticised not only for colour bar and the compound system, but also for its low black wages and its hostility to black trade unions. Writing in *A History of South Africa: Social and Economic* in 1941, CW de Kiewiet pointed out that gold mining in South Africa was very expensive because of the small amount of gold in vast tonnages of rock: “The concept of an industry that was colossally wealthy only on condition that it jealously watched each penny of its expenditure is invaluable for any understanding of the history of South African gold mining.”

According to John Lang, after the end of the First World War the leaders of the mining industry took a decision to build a vast low-grade industry instead of exploiting only the higher-grade ores in fewer mines. This meant spreading dividends over a number of years but also holding down wages because lower-grade mines would not be able to pay the wages that higher-grade mines could afford.

Like agriculture and domestic service, mining was for a long time one of the lowest paying sectors of the economy. In 1972, for example, the average monthly wage of black miners was R22, against R49 in the retail trade and R60 in manufacturing and construction. By 1985, however, the black wage in mining had risen to R360, overtaking the average black construction wage of R351. Black mine wages had also overtaken those in clothing manufacture and were beginning to catch up with other parts of the manufacturing sector.

> *Like agriculture and domestic service, mining was for a long time one of the lowest paying sectors of the economy. This is no longer the case. According to the Chamber, the average wage on gold mines in 2015 was R28 076 a month. Wages in mining and quarrying as a whole are lower than this, however. According to Stats SA, the average in February 2017 (including bonuses and overtime) was R22 185 (against R16 270 in manufacturing).*

Comparative racial breakdowns of wages by sector in more recent years are difficult to come by, but in 1997 average mine wages of all races had almost caught up with those in the wholesale and retail trade and catering and accommodation sector. They were also beginning to catch up with those in manufacturing as a whole. By 2017 wages in mining and quarrying had comfortably overtaken both of these sectors as well as the finance, real estate, and business services sector, with construction lagging far behind. Only government; transport, storage, and communication; and electricity, gas, and water now pay higher average wages than those in mining. Bernard Swanepoel, former chief executive of Harmony said in January 2017 that to unskilled and unemployed people, jobs in mining were more attractive than those in other sectors.

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Prompted by extensive adverse publicity for the mining industry subsequent to the violence at Marikana in 2012, and a five-month strike in 2014, average mine wages in the last three years have risen by 45% in nominal terms, a far greater increase than was given in any other sectors. If mine wages continue to rise more rapidly than those of other sectors, mining is likely to overtake the transport, storage, and communication sector, and may even overtake government, to become the best paying sector in the economy after electricity, gas, and water. At the same time, of course, the mining industry will continue to shrink as a source of employment, the number of jobs in mining having dropped from 693 000 in 1990 to 467 000 in 2017, a decrease of almost a third in 27 years.

According to the PWC report cited above, South Africa has the highest cost of labour as a percentage of total costs among the major mining producers. It averages around 60%, whereas the costs in the United States and Australia average around 30% to 40%. The higher labour costs in South Africa are said to be the result of the labour-intensive deep-level mining prevalent in South Africa.

Shortly after Marikana, it was widely reported both in South Africa and abroad that rock drillers at Lonmin earned only R4 000 a month. However, according to the Solidarity trade union the total cost package was approximately R10 500 a month, excluding bonuses. Lonmin said in January 2017 that miners who had had been striking for a minimum wage of R12 500 would be earning a basic R12 296 by 2019, excluding allowances for rock drillers.

At the time of writing this report, the government was planning to introduce a national minimum wage of R20 an hour from May 2018. This would translate into between R3 000 and R3 500 a month depending on the length of the working day. Minimum wages on the mines are about double this. Sibanye, for example, introduced an entry-level wage for surface workers on gold mines in July 2016 of R7 200 a month, the entry level underground being R7 700. The living-out allowance is R2 100, while the value of food and accommodation varies from R2 500 to R4 000 a month, depending on the operation.

According to the Chamber, the entry-level wage in the platinum industry is about R6 500. However, following negotiations with some of the mining unions, lowest basic wages for underground workers on some of South Africa's major platinum and gold mines will rise from R8 000 to R11 000 by 2018. The minimum at Lonmin will rise to R11 700.

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Migratory labour

The Marikana shootings concentrated more public attention on the migratory labour system on South Africa's mines than it has received for many years. Some critics blamed the incident on that system. There were renewed calls for it to be phased out. Mining companies were lambasted for not providing much better housing for their employees in surrounding townships. Some of the criticism was based on televised footage of shacks in which some of the miners lived after they had moved out of hostels on the mine and used their living-out allowances provided by the mine to obtain accommodation in nearby townships. Some brought their families with them. Others spent minimal amounts on their own accommodation, preferring to send more money to families back home in rural areas, some of which are not in South Africa.

Whether they live in hostels on mine property, or in surrounding areas, the fact that migrant workers spend much of their working lives away from their families has long been a major source of criticism of the migratory labour system. Even though the previous government's laws entrenching it no longer apply, getting rid of the migratory labour system is far easier said than done, however. Nor would it necessarily be desirable, let alone fair to people in rural areas working or seeking work on the mines.

Teba, the current name for an agency set up by the mining industry at the beginning of the last century to recruit black labour for the mines, still has some 281 000 miners on its books, most of them from South Africa but 57 000 of them (20% of the total) from Mozambique, Lesotho, Swaziland, and Botswana. Apart from depriving sending areas of income, replacing these miners by urban-based labour would be problematic from various practical points of view. Sibanye said that it tried to employ local people (from communities within 50 kilometres of operations) "as far as possible". Even so, only 33% of its 46 269 employees at the end of 2015 could be defined as local. "A large percentage with core skills, experience, and many years of loyal service were drawn from labour-sending areas in rural provinces of South Africa and neighbouring countries."

A detailed discussion of the future of the migratory system is beyond the scope of this paper, except that it is necessary to emphasise the importance of both flexibility and choice, especially choice on the part of mineworkers as to whether to live in hostels without their families, make use of family accommodation built by the mines, or live with or without their families in rudimentary shack accommodation in nearby townships. A flexible policy would also involve the upgrading of hostels rather than phasing them out. It would further avoid "one-size-fits-all" policies imposed by the state. Shorter contracts enabling migrant miners to return home more frequently and for longer would make for a more flexible and humane system.

Some of these issues were explored in greater detail in a paper entitled *Digging for Development: The Mining Industry in South Africa and its Role in Socio-economic Development* published by the IRR in 2014. It should also be borne in mind that miners who live in shacks surrounding the mines may well have better houses in rural areas that they regard as their real homes. The president of the Association of Mineworkers and Construction Union, Joseph Mathunjwa, queried why people would want to buy a house in Rustenburg "when they already have a house in KwaZulu-Natal, for example." He said that if people rented accommodation on the mine, the mining company should arrange transport to their homes because that was where they had built their houses.

Whatever its deficiencies, one of the advantages of the migratory labour system is that the earnings of miners are spread into some of the more impoverished parts of South and southern Africa, supporting families and local economies, and reducing the incidence of poverty. Without jobs in mining, unemployment in these areas would be even higher than it already is: in the Eastern Cape, for example, unemployment in 2015 was running at 42.5%, against the national figure of 34.9%. Teba said in 2014 that "if you go on radio and say we are recruiting in Lusikisiki, you will get people from 600 kilometres away coming to that office". It should also be remembered that there are many more migrant workers in South Africa than those employed in mining.

Whatever its deficiencies, one of the advantages of the migratory labour system is that the earnings of miners are spread into some of the more impoverished parts of South and southern Africa, supporting families and local economies, and reducing the incidence of poverty.

Moreover, given that neighbouring countries supplied labour to the South African mines for decades when South Africans were reluctant to work for the low wages on offer, South Africa has a moral obligation not to cut these poorer countries off from a source of employment in an industry to whose development they contributed so much.

Various companies have made commitments to provide more housing. Some, among them Anglo American Platinum, scaled these down as they cut their workforces. Lonmin, which has been the focus of continuing media attention ever since the Marikana shootings, has been strongly criticised for failing to meet its housing commitments, for which it has budgeted R500 million. The Bench Marks Foundation said in January 2017 that if the company failed to meet its demands by August 2017 it would campaign internationally for Lonmin's mining licence to be revoked. Apart from a living wage of R12 500 a month, the foundation's demands included "comprehensively addressing the housing needs of workers, 33 000 of whom lived in informal housing without access to electricity, basic sanitation services, or running water". Mr Zuma also threatened to revoke the licence if the company failed to meet its own housing targets. Mike Schussler, an independent economist, said that if Lonmin were to shut up shop, families would be robbed of their breadwinners "from managers to cleaners".

The renewed criticism of Lonmin followed a report in August 2016 in which the company was lambasted by Amnesty International for having built only three showhouses after it had pledged to build an additional 5 500. The company said that one of the reasons it had not built the houses was that "our employees do not want houses. They want to go back to their home countries and province. They choose to live in informal settlements." The mine provided hostels for some miners, while others were given living allowances. "They have a choice as to whether to live in a hostel or rent a room." Referring also to the mine's financial difficulties, the company said it had submitted a revised social and labour plan (SLP) to the Department of Mineral Resources (DMR). As we shall see below, in December 2017 Mr Magara did a deal with Mr Froneman, in terms of which Sibanye would become the owner of Lonmin.

Housing allowances

The housing allowances paid by various companies are set out in the October 2015 agreement between the Chamber and various trade unions. Glencore's lowest living-out allowance from July 2017 was to be R4 328. Exxaro was committed to pay R6 600 from that date. Anglo American's coal mines committed themselves to pay R8 791 from January 2018.

Shack settlements

Miners at Marikana and elsewhere are not the only people in South Africa living in shacks or "informal dwellings", as they are officially called. Any visitor to Cape Town, where there is next to no mining activity, would have noticed the vast shack settlements adjoining the airport. Elsewhere, even in much smaller urban areas, people who have nothing to do with mining live in shacks. Shack settlements have also sprung up near Eskom's power stations and the mines supplying them. Near the Duvha power station outside Witbank, for example, is the Masakhane settlement, which has grown to 3 400 homesteads in the last few years as people have moved to the Highveld looking for work.

> *Providing shack settlements with adequate services, including water, sanitation, electricity, and refuse removal, is arguably the responsibility of government, rather than of particular industries. However, many local authorities are so badly run, and sometimes so corrupt as well, that they are unable to provide services.*

Indeed in 2016, according to Stats SA, more than two million households lived in informal dwellings in backyards, on farms, or in "informal settlements" (which are sometimes referred to as "squatter camps"). There were a total of 2 225 informal settlements in the country. They usually appear unsightly and ramshackle and are sometimes referred to as "squalid". Shacks, invariably built very close to one another, are also susceptible to fires that destroy hundreds of homes and extinguish lives. But they are a form of affordable housing for poor people. Any attempt to eliminate shack settlements in one area would simply lead to the erection of shacks elsewhere by the people displaced. Providing shack settlements with adequate services, including water, sanitation, electricity, and refuse removal, is arguably the responsibility of local government, with the support of national and provincial government, rather than of particular industries. However, many local authorities are so badly run, and sometimes so corrupt as well, that they are unable to provide services and/or collect payments for those that they do provide.

Steve Phiri, chief executive of Royal Bafokeng Platinum, said that a line had to be drawn in the sand as to who was ultimately responsible for mining communities: the private sector or the government. He said that although his company had ploughed R2.8 million into housing in Rustenburg, it was required to pay for the supporting infrastructure as well.

The proportion of South African households living in "informal" dwellings dropped from 16% in 1996 to 14% in 2016. The number, however, rose from 1.45 million to 2.31 million. Although the number of households living in so-called "formal" dwellings rose from 5.79 million to 13.31 million, provision of formal housing was not fast enough to cope with additional demand arising from such factors as urbanisation and diminishing average household size. Hence the growth in shack dwellings, many of them erected by people who could not afford brick-and-mortar structures anyway.

Communities

Although they overlap, there are two broad issues here. One is the extent to which local communities are consulted about the grant of mining rights where they live. The other is whether local communities benefit from mining in their area. Prior to enactment of the Mineral Resources and Petroleum Development Act of

2002, which vested custodianship of all mineral resources in the state, local communities sometimes had freehold rights, in terms of which they had ownership of mineral resources in their land and were consequently in a stronger bargaining position vis-a-vis mining companies wishing to exploit these resources.

Several legal practitioners attempting to help local communities in former homeland areas have complained that mining rights are sometimes granted without their consent or even without consulting them. A key part of the problem is that land occupants in former homeland areas have weak tenure rights but are subject to the jurisdiction of traditional leaders, some of whom have been accused of trading the rights of communities for personal shares in mining companies. Although social and labour plans (SLPs) are designed to benefit local communities, several communities have complained that they are denied the right to say yes or no to mining where they live. They also complain that the plans are agreed to without their involvement, and that they are kept in the dark about deals made between traditional leaders and/or politicians as to who benefits from the mining.

A community leader near the Mogalakwena platinum mine run by Anglo American Platinum (Amplats) said in October 2017 that his community would shut down the mine if not given R175 million supposedly being given to tribal leaders. Chris Griffith, chief executive of the company, said it was "trying to get away from some of the previous structures where we felt obliged to pay the money over to the [chief]. Protests have previously led to shutdowns of this, the world's largest opencast platinum mine, and in January 2018 it was reported that a deal had been reached with the local community in terms of which the Mapela Trust would in future be run more transparently and the chief's power diminished.

Applicants for mining rights issued by the DMR are required to submit a social and labour plan (SLP) for approval before the rights will be granted. According to Niel Pretorius, chief executive of DRD Gold, SLPs make "perfect sense" but obtaining approval for them is very difficult: "The communities around mines are not homogeneous in composition; people in these communities have different needs and, therefore different priorities."

In November 2017 a report by a panel headed by Kgalema Motlanthe, a former president, said that post-1994 legislation had abolished the rights of landowners to say no to mining on their land. This had had "devastating impacts" for members of rural and customary communities who had borne the brunt of the removal of their express right to say no to mining development. The report also said that community representatives insisted in every public hearing that they had seen no benefit from mining. It was also claimed that traditional leaders entered into contracts with mining companies but failed to disclose the details or distribute the benefits among the people whose rights were undermined.

Applicants for mining rights issued by the DMR are required to submit a social and labour plan (SLP) to the department for approval before the rights will be granted. These plans outline the company's contribution to local community development. Typically, says the Centre for Applied Legal Studies at the University of the Witwatersrand, they contain commitments to housing schemes, building of schools and clinics, contribution to infrastructure upgrading, and adult literacy programmes. According to Niel Pretorius, chief executive of DRD Gold, SLPs make "perfect sense" but obtaining approval for them is very difficult: "The communities around mines are not homogeneous in composition; people in these communities have different needs and, therefore different priorities."

The Bench Marks Foundation said in October 2017 that most of the almost 40 communities that it worked with said they had seen little or no benefit from mining. Said the foundation, "The profits largely go off shore." As we have seen above, this applies to only some of the profits. One of the local groups benefiting from Lonmin, for example, is the Bapong community. Lonmin, however, is now caught in crossfire between rival factions of this community and the traditional council which supposedly represents it. Last year a newly-elected council asked the company to halt payments to a council which it had ousted. However, at the end of the year the company made a payment of R5 million to the ousted council under pressure from the DMR and threats that the ousted council would seek to have its mining licence revoked. A Lonmin executive complained that the ousted council had failed to supply financial statements, and that although the company was accused of sowing divisions within the community, it was "stuck with a community that is not in harmony".

According to Tebello Chabana, a senior executive of the Chamber, the industry spends approximately R2 billion a year on "mine community development" through SLPs in host communities and labour sending areas. As already noted, local communities receive about 1% of the expenditure of mining companies, in contrast to employees, who receive almost 40%. The 1% is probably an underestimate, however, in that some companies have policies of local procurement, with the result that the actual amount going into local communities (in addition to wages) is higher than the 1% but is reflected in procurement rather than social expenditure. Local procurement can be complicated, however. Some companies in the gold, platinum, and chrome sectors have found themselves subject to disruptive action and even arson attack by local groups demanding procurement contracts for themselves at the expense of the wider community. Some of these groups have been accused of running "Mafia-type protection rackets".

> *Although the term "social and labour plan" is new, the concepts of corporate social investment and corporate social responsibility are not, certainly not in South Africa. Mining and other companies have been ploughing money into education, housing, and other areas since long before the ANC came to power. Many examples could be cited.*

Eunomix, a research agency, said that most of the population of Rustenburg had failed to benefit from the platinum boom (which came to an end some years ago). However, it said, spending by Rustenburg mining companies on education, health, housing, and infrastructure was still much higher than that of local government. The managing director of Eunomix, Claude Baissac, said that mining companies were apparently expected to compensate for the government's social spending shortfall and to shoulder more onerous social spending budgets than other industries, such as retail and manufacturing. Possibly this was because physical and social infrastructure in most mining communities was poor, while other industries tended to be in better developed urban centres. But it could also reflect a view that mining benefited most from apartheid and had to make amends.

Corporate social responsibility

Although the term "social and labour plan" is new, the concepts of corporate social investment and corporate social responsibility are not, certainly not in South Africa. Mining and other companies have been ploughing money into education, housing, and other areas since long before the ANC came to power. Many examples could be cited. One will suffice. One enterprise development project at whose launch by Anglo American the present writer was present is Zimele, which between 1989 and 2015 has provided R1.6 billion in funding for 2 206 businesses that collectively employed nearly 47 000 people and generated turnover of nearly R9 billion.

The largest corporate donor in the country is probably the Anglo American Chairman's Fund, which dates back to the late 1950s. Its current funding priorities go far beyond mining communities, and include early childhood development; maths, science, and language development at school level; strengthening the public health care system; and capacity building for community-based and other non-governmental organisations.

In August 2015 Mr Froneman of Sibanye said that although he was conscious of his social responsibilities, mines were not charities. Mining companies in South Africa had a higher social burden than those in developed countries, but it was not smart to keep on loading the back of the camel until it broke because there would then be no upliftment. "I would argue that the mining companies have done a hell of a lot more than is acknowledged. We do more than just comply. But when we are put under pressure to do something that does not make commercial sense, that is when we dig our heels in."

The Chamber said that although the industry had an aggregate loss of R37 billion, it spent more than R5 billion on skills development in 2015, while between 2011 and 2015 it funded more than 12 500 students in tertiary education. It also spent some R180 million supporting lecturers in university faculties teaching mining engineering.

Safety

Mining is probably one of the most hazardous peacetime occupations. According to *Death in South African Mines*, an undated study published in the early 1960s by HJ Simons, professor of native law and administration at the University of Cape Town (UCT), 36 000 men had been killed in accidents on South Africa's gold mines since the beginning of the century. He said that the annual death toll on all mines fluctuated at around 800. Some 30 years later, in 1983, the figure was still a high 831, according to government figures. Twenty years after that, according to the Chamber, it had dropped to 246.

In the last 10 years it has been below 200, dropping in the last few years to below 100, most deaths occurring on gold mines, followed by platinum and then by coal mines. According to the Chamber, the 77 fatalities in 2015 were the lowest in the industry's history. The following year, according to the minister of mineral resources, Mosebenzi Zwane, they dropped to 73 (excluding fatalities among illegal miners). Mike Teke, the then president of the Chamber, said that the safety performance on the mines compared favourably with sectors such as construction in South Africa, and with similar mines in the US, Australia, and Canada. The decline in fatalities has been achieved despite the ever-increasing depths at which gold mining in particular takes place.

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The three main causes of fatalities, according to the Chamber, are rock falls, transport accidents, and accidents which include inhaling of dangerous fumes. According to Sibanye, deaths still occur as a result of non-compliance by employees and management as people try to take short cuts. Solidarity, a union with members in the mining industry, says pressure to reach production targets is "huge", even though this sometimes means that miners remain in unsafe workplaces. The Chamber wrote to all its members urging heightened attention to safety and health. As we shall see below, the DMR has been closing mine shafts following accidents. Mr Zwane said in January 2017 that his department wanted to prosecute "negligent" companies.

Although the accident rate has dropped substantially, safety remains an issue on the mines. However, several times in the past few years mining companies have complained that the DMR has ordered shutdowns of entire mines when safety issues could be addressed without stopping all operations. Mining executives have complained that the DMR has a "trigger-happy" approach, ordering complete shutdowns when partial shutdowns limited to the area of the accident would suffice. One executive said in 2015 that if stoppage notices, issued under Section 54 of the Mine Health and Safety Act of 1996, were challenged, "you get bullied, audited, and stopped to death".

The Chamber said it supported the justified application of stoppage notices, but that in some cases they were applied inconsistently and unfairly, and often involved the shutting down of unaffected areas. It said that the cost of safety stoppages in lost revenue between 2012 and 2015 was R13.6 billion, excluding the losses incurred in restarting mines. Although the DMR said it did not issue stoppage notices to victimise mining companies but as a corrective measure to protect the lives of mineworkers, an attorney with a large law firm said that "enforcement issues are all too frequently approached in an aggressive, heavy-handed, and ill-considered manner". Mr Phiri of Royal Bafokeng said in 2016 that lack of experience among inspectors was part of the problem. He added that the increasing frequency and severity of stoppage orders did not appear to be addressing compliance with safety standards.

AngloGold Ashanti, which at the time was still operating five deep mines in South Africa, complained in August 2016 that only six of the 77 stoppage notices issued to it in the first half of the year related to fatal accidents; the rest were the result of audits and inspections and on technicalities.

In November 2016 the Labour Court overturned an order shutting down AngloGold's Kopanang mine near Orkney in North West province. In his judgment, André van Niekerk said that the order, which was causing losses to the company of R9.5 million a day, had been "out of all proportion" to the problems identified. This was because it prohibited various operations "across the entire mine" even though no reasonable person would believe that "infractions" on a "minute" part of it endangered the health and safety of anyone on the rest of the mine.

Judge van Niekerk said that the Mine Health and Safety Act had "as its commendable purpose the protection of the health and safety of employees in mining", but that this did not "entitle those responsible for enforcing the Act to act outside the bounds of rationality".

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Towards the end of January 2017, Sibanye served summonses on the minister and three of his officials claiming R26.8 million from them in their personal capacities. The company said the three inspectors had acted in a "draconian" way at its Kroondal platinum mine in North West by closing down all five of the mine's shafts after a miner had died in one of them in August 2016. At least nine stoppages had been ordered over the preceding 18 months. These had cost the mine, which employed 9 500 people, R180 million and rendered it marginal. The company said that the actions of the inspectors had been "irrational, arbitrary, and capricious" and taken for an "improper purpose" not permitted by the Act.

The minister accused AngloGold and Sibanye of "refusing to comply with the mining laws of the country". He said that the two companies had been responsible for the deaths of 19 mineworkers in 2016. "If companies cannot mine safely, they should not be mining at all, and should allow other potential holders who will respect the laws of our country to continue mining." AngloGold said it had reduced its operating fatalities rate by more than 80%. Mr Froneman said that the view of some officials that "we do not take safety seriously" is "absolute crap". Their heavy-handed decisions could tip the mine from being viable into the red. "Who loses? The workers, who'll get laid off if those mines become unviable." He added that the most dangerous part of a miner's job today was travelling on the road to work.

Patrice Motsepe, chairman of Harmony Gold, said that the company would consider the closure of deep-level mines if the health and safety of workers was threatened. On the other hand, Paul Sebegoe, chairman of a civic association in North West province, said that any attempt to close the Royal Bafokeng Platinum mine, which had been ordered to suspend operations under section 54, would be met with "fierce resistance" because "our fathers, brothers, uncles, and members of the community are dependent on these mines".

Christo de Klerk, chief executive of Mine Rescue Services, a non-profit company financed by the mining industry, says that mine managements have been going all-out to improve safety. He said that rescue teams, all of whose 900 members are volunteers, had previously had to deal with 60 underground fires a year, but that this number had dropped in 2015 to 13. Mine Rescue Services is reported to spend about half its time on accidents involving illegal miners, and on recovering bodies from abandoned mines, of which there are now several thousand. Hilary Joffe, editor at large of *Business Day*, described mine rescue work as “horrible, high-risk, and heroic”.

Health

Lung diseases, notably silicosis and pulmonary tuberculosis (TB), have taken a grievous toll on huge numbers of people all over the subcontinent. Whites as well as blacks have suffered, although the migratory labour system has meant that detection among blacks may occur very late in the day, if at all. It can, for example take up to 15 years before symptoms of silicosis become apparent. Migrant workers who return home after completing their years of service on the mines do not have easy access to testing facilities, let alone treatment. People living in close proximity to one another in mine hostels, as is still the case for many miners, are particularly prone to contracting TB.

Dating back to 1911, legislation provides for compensation financed by Parliament and by levies on the mining industry. Compensation takes the form of reimbursement of medical expenses plus a lump-sum payment to a maximum of R105 000. The government said in 2016 that R1.4 billion had been paid out over the past 30 years to nearly 97 000 beneficiaries. There are apparently another 90 000 claims that have been approved but not yet paid, and up to 700 000 still to be assessed. One of the problems for many people suffering from lung disease and entitled to compensation is the complexity of the application process. Migrant workers who have returned to rural areas in South Africa or to neighbouring states are particularly handicapped in this regard. Many (or their bereaved dependants) may be ignorant of their rights. Several mining companies have been trying to assist the Department of Health with the administration of its fund, which had virtually “collapsed”, according to an admission in 2012 by its new commissioner. This is a little-known aspect of the major problems vast numbers of South Africans face as a result of the breakdown or maladministration of state institutions.

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While the statutory compensation fund wallows in chaos, some of the victims of silicosis and TB have launched civil proceedings against mining companies. According to a judgment handed down by the South Gauteng High Court in May 2016, South Africa’s gold mining industry “left in its trail tens of thousands, if not hundreds of thousands, of current and former underground mineworkers who suffered from debilitating and incurable silicosis and pulmonary tuberculosis”. Many mineworkers had died from the disease. The judgment gave the go-ahead for a major class-action lawsuit for damages against 32 gold mining companies in respect of 82 gold mines under their control. Those eligible to join the action included current employees; former employees dating back to 1965; and dependants of any who had died. The court accordingly ordered that the class action which it had authorised should be extensively advertised on radio and in newspapers in numerous different languages in South Africa and neighbouring states which had supplied labour to the mines.

Although the case seeking leave to bring the class action had been mounted by only 69 mineworkers, the court said that the number of potential members of the class on behalf of whom the action would be brought could range from 17 000 to 500 000. The court added that the mineworkers intended to bring evidence proving that the mining companies knew, or should have known, as far back as the early 1900s that silicosis and other dust-related occupational diseases were preventable, but that they had failed to introduce appropriate preventive measures. (Unlike statutory compensation, which is payable irrespective of whether mining companies are at fault, the compensation sought in these civil proceedings will depend on proof of delictual liability on the part of the mining companies.)

Some of the affected companies have taken the judgement on appeal. However, it was reported in December 2017 that six of the largest gold-mining companies were working on a draft agreement to pay some R5 billion into a trust to pay compensation to sick miners and their families. The trust would also seek to trace eligible claimants. A spokesman for the group said these companies were seeking to eliminate silicosis entirely, and that major progress had been made in recent years.

Richard Spoor, one of the most prominent of the lawyers acting for the mineworkers, said that South Africa needed fundamental legislative reform to ensure accountability. "If there was greater accountability, we would see a dramatic decrease in the incidence of these diseases." Legislation did not accord with international best practice. Statutory compensation schemes were also collapsing under the weight of growing administrative incapacity, "leaving thousands of sick and injured workers in the lurch".

In 2002, thanks in large part to the persistence of its chief medical officer, Brian Brink, Anglo American became one of the first companies in South Africa to provide free antiretrovirals to its employees and later to their dependants. It did so, moreover, at a time when the minister of health was hostile to the provision of such medication.

HIV/AIDS has taken its toll on miners and the mining industry. As Anglo American pointed out, pulmonary TB and AIDS are "inextricably linked". It is also likely that many miners, away from their own families, established extramarital sexual relationships, helping to spread these diseases. Although the number of new HIV infections in South Africa has halved in the past 15 years, the TB prevalence rate has increased substantially.

In 2002, thanks in large part to the persistence of its chief medical officer, Brian Brink, Anglo American became one of the first companies in South Africa to provide free antiretrovirals to its employees and later to their dependants. It did so, moreover, at a time when Dr Manto Tshabalala-Msimang, minister of health in President Thabo Mbeki's government, was hostile to the provision of such medication, as was Mr Mbeki himself. However, in 2015 Anglo was able to report that "investing in HIV prevention, treatment, and care has a measurable and positive impact on business performance." Dr Brink had long argued that providing antiretrovirals would ultimately cost less than not doing so. Anglo is acknowledged to have made a major contribution to the combating of AIDS in South Africa. In a citation for an honorary degree Dr Brink later received from the University of the Witwatersrand, Anglo and AngloGold were credited for having "set an example for the state health service to follow once the resistance of government leadership to antiretroviral treatment had been overcome".

NATIONAL LIVING STANDARDS

The statistics below cover all sectors of the economy, as a breakdown into mining and other sectors is not available. But people who work on mines, as well as their families, are likely to have participated in, or benefited from, some of these trends. Where there have been economic downturns, these are likely to have affected the people on mines as well as the population at large. Where figures for each of the four official race groups are available, only those for Africans are used on the assumption that this section of the population had the most catching up to do. Where racial breakdowns are not available, the overall figure (which includes the white, coloured, and Indian/Asian minorities) is used.

GDP per head: Real gross domestic product (GDP) per head declined more or less steadily between 1981 and 1993, but then began to increase again until 2008, declining somewhat after that in line with lower rates of economic growth.

Household income: Between 1996 and 2016, annual average income (including income from social grants) of African households grew by 307% in current prices.

Personal income: Over that same period the annual per capita income of Africans (again including income from social grants) grew by 470% in current prices.

People with bank accounts: Between 2007 and 2015, the proportion of Africans with bank accounts rose from 56% to 75%, or by nearly 34%. It may be assumed that the increase in the proportion is accounted for by rising incomes. It is further assumed that access to a bank account makes for greater convenience, a component of higher living standards.

> *The number of African households living in formal dwellings rose from 3.43 million in 1996 to 10.20 million in 2016. The proportion of all households in South Africa with access to flush or chemical lavatories rose from 50% in 1996 to 64% in 2016. The proportion using electricity for lighting rose from 58% to 92%.*

Housing: The number of African households living in formal dwellings rose from 3.43 million in 1996 to 10.20 million in 2016. The proportion of all households in South Africa with access to flush or chemical lavatories rose from 50% in 1996 to 64% in 2016. The proportion using electricity for lighting rose from 58% to 92%. The proportion using it for cooking rose from 47% to 82%, although the proportion using it for heating dropped from 45% to 37%.

Cellular telephones: The number of subscriptions to cellular telephones in South Africa rose from 8.34 million in 2000 to 81.20 million in 2016, an increase of 873%.

Living standards measures (LSMs): Living standards measures (LSMs) are based on ownership of various kinds of household goods and services, including hot running water from a geyser, washing machines, television sets, dishwashers, number of motor vehicles, and whether a person has access to a domestic worker. The proportion of South Africans in the bottom of the ten LSMs has dropped from 11% in 2001 to 1% in 2015. The proportions in the other lower LSMs have also dropped.

On the other hand the proportion of people in the higher LSMs has risen. Since Africans comprise 78% of the people classified by LSM, the movement of more and more people from the lower LSMs to the higher ones is largely accounted for by the acquisition by African households of more and more household goods and services. This reflects a rise in living standards, made possible by rising incomes. Whereas in 2004, Africans accounted for only 5% of LSM 10, the top category, that proportion had risen to 30% in 2015.

Infant mortality rate: South Africa's infant mortality rate dropped from 46 per thousand live births in 1994 to 32.8 in 2017.

Severe malnutrition: The incidence of severe malnutrition among under fives dropped from 13.1 in 2000 to 4.5 in 2014. The numbers refer to children who weigh below 60% of their expected weight for their age per thousand children under the age of five.

Diarrhoea: The incidence of diarrhoea among under fives dropped from 133 per thousand children in 2001 to 90 in 2012.

Child support grants: The number of children receiving support grants rose from 21 997 in 1998/99 to more than 12 million in 2017.

African university enrolment: The number of Africans enrolled at university rose from 54 997 in 1986 to 696 320 in 2015.

Africans obtaining degrees: The number of Africans obtaining first degrees rose from 8 514 in 1991 to 87 033 in 2015. Africans accounted for 21% of all first degrees awarded in 1991, but 70% in 2015. This indicates that Africans have improved their position both in absolute terms and in relation to the other population groups.

Cautionary note: Not all trends are positive. The death rate per 100 000 people from tuberculosis (including deaths in HIV-positive cases) rose from 78 in 1990 to 133 in 2015. The HIV prevalence rate among women attending public antenatal clinics has risen from 2.2% in 1992 to 29.7% in 2013 (a figure which appears to have stabilised).

> *The number of jobs in mining has dropped from 693 000 in 1990 to 457 000 in 2016. This decline of 34% is greater than those in manufacturing and agriculture, the two other major sector to record substantial declines. Overall, of course, there has been a net increase of 3.05 million jobs, though this is far fewer than the increase of 4.60 million in the economically active population – hence the rise in unemployment.*

Another negative trend is, of course, unemployment. On the expanded definition (which includes "discouraged" workers) it has risen from 3.67 million to 8.88 million. Long-term unemployment has risen from 2.55 million to 3.40 million. The number of jobs in mining has dropped from 693 000 in 1990 to 457 000 in 2016. This decline of 34% is greater than those in manufacturing and agriculture, the two other major sectors to record substantial declines. Overall, of course, there has been a net increase of 3.05 million jobs, though this is far fewer than the increase of 4.60 million in the economically active population – hence the rise in unemployment.

Given the substantial rise in mine wages referred to below, African miners are likely to be among the beneficiaries of some of the positive trends described above. But given that mining accounts for less than 10% of total employment, people employed in other sectors are likely to have benefited even more. This would apply especially to fast-growing sectors with relatively high wages, notably finance and government. At the same time, it should be remembered that some of the positive trends arise not from earnings but from transfers. This would apply to social grants, education and of course incomes in general.

All the data on living standards cited above should be viewed in the light of these qualifying factors.

THE ENVIRONMENT

Mining has several unavoidable detrimental effects on the environment, all of which appear to be exacerbated by poor legislation and/or weak law enforcement. According to a statement in November 2017 by the Department of Water Affairs and Sanitation, at least 36 mines are operating without water usage licences. Afriforum, a non-governmental organisation, is trying to get the government to take action as unlicensed companies sometimes pollute water sources.

Mine dumps, also known as "tailings" or slimes dams, were once a major distinguishing feature of Johannesburg and adjoining towns. They were also once a major source of pollution. After the gold had been extracted from it, the crushed rock brought to the surface was deposited on to these dumps. There it combined with rainwater to form sulphuric acid which then dissolved uranium and other metals as it flowed or seeped into the local groundwater. The dumps also produced airborne radioactive material, although very often people living near them were unaware of the resulting health risks.

In more recent years, as gold mines have been worked out, they have often been abandoned, filling up with rainwater. This has then become acidic and enriched in heavy metals, thereafter finding its way into the underground water supply as well as into rivers and dams. Once abandoned, coal mines have also contributed to pollution of the water supply. The Vaal, Crocodile, and Olifants rivers and their tributaries, along with the Middelburg and Witbank dams in Mpumalanga province, are among the major water sources in the country that have become polluted via this process, commonly known as "acid mine drainage". The resulting contamination is harmful to aquatic life and dangerous to anyone reliant on the water for agriculture or household use.

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According to a study produced for the Gauteng city region in 2015, the province contains 374 "mine residue areas", which include tailings dams as well as other sites of localised mine waste. Along with 6 152 "ownerless and derelict mines" they "continue to pollute the soil, air, and water". Rehabilitation costs have been estimated by the auditor general at R30 billion or more. Partly as a result of poor regulation or the absence thereof, the mining industry was able to "externalise" the environmental costs of mining, the Gauteng study said. Consequently the financial liabilities of the ownerless and derelict mines "now sit as a tax burden on the broader economy".

Some companies have, however, reacted strongly to accusations about tailings dams. In September 2017, DRDGold, whose main business is the recovery of gold from tailings dams around Johannesburg and on the West and East Rand, rejected allegations by the Bench Marks Foundation that dust emissions from its operations were responsible for respiratory diseases among Soweto residents. The company's chief executive, Niel Pretorius, said it had significantly reduced emissions to the point where there was hardly any dust coming through unless the wind was pumping at 50 knots from the south east. "There is only one institution that is pumping money into rehabilitating tailings dams. DRDGold has spent more money on rehabilitation in the last 10 years than on paying dividends." In response to statements by the Bench Marks Foundation that in the Riverlea township west of Johannesburg some people were living on oxygen machines in almost every street because of respiratory illnesses, Mr Pretorius said at the end of 2017 that he would remain "sceptical about these claims" until he saw medical evidence.

In addition to these problems, according to Agri SA, a large organisation representing farmers, mining "has had a significant negative impact on agriculture". Conflict between the two sectors occurred when, for example, crop yields were limited or impeded by pollution. Other problems included the deterioration of roads and other infrastructure, and more crime in mining areas. Sometimes there was "a total lack of rehabilitation of mined land after closures". The Transvaal Agricultural Union added that rehabilitation of soils was often never fully achieved; there were cases where the quantity of maize harvested dropped from between 6 and 8 tonnes per hectare before mining to between 1 and 1.2 tonnes afterwards.

Apart from degradation of the landscape arising from mining, the burning of coal in power stations causes pollution in the form of oxides of nitrogen and sulphur. These problems are particularly acute on the Mpumalanga Highveld, home to 12 of Eskom's 15 coal-fired power stations and the numerous mines feeding them. This part of the country also hosts the coal mines supplying Sasol's coal-to-liquids plant at Secunda.

A report entitled *The Destruction of the Highveld* issued in November 2016 by GroundWork South Africa, a non-governmental organisation, said that coal mining had ruined both the land "on an immense scale" and water systems. It had also polluted the air, and damaged all body systems. "It chokes the lungs, poisons the blood, interrupts the heart beat, and disables the mind and nervous systems". People also died of heatstroke, while their houses were "repeatedly shaken by mine blasting".

The report said that mining companies were indifferent to their impacts on the environment and on people. They had also enjoyed impunity for a century with the active collaboration of government, in particular the DMR and the Department of Energy. Once the DMR had issued a mining right, companies started digging and "let the devil take the environment". Labelling all this a form of "environmental injustice", the report said that mining was a "doomed venture" and that "the end of coal is nigh". Saying no to mining meant standing "in solidarity with the planet".

Under the National Environmental Management Act of 1998 mining companies are required to deal with "ongoing rehabilitation" of mining areas during the operational life of the mine. They are also required to manage its final rehabilitation when it closes. They are further required to provide for latent environmental damage that may come to light after closure.

According to other reports, local authorities on the Mpumalanga coalfields have moved some 6 000 families out of 12 500 targeted for relocation to cleaner areas, but some families resist as they wish to remain as close to their jobs as possible. The Department of Environmental Affairs says that impact assessments and licensing authorisation processes are now stricter. Under the National Environmental Management Act of 1998 mining companies are required to deal with "ongoing rehabilitation" of mining areas during the operational life of the mine. They are also required to manage its final rehabilitation when it closes. They are further required to provide for latent environmental damage that may come to light after closure. Contraventions may result in fines or imprisonment.

One of the problems is proper enforcement. According to a report by the Department of Planning, Monitoring, and Evaluation, the DMR does not adequately police mine rehabilitation funds. Nearly half of South African mines did not set aside enough money to clean up their mess, and the DMR lacked the necessary capacity, staff, and legal expertise to do its job. Agri SA said that "state governance of mining is poor". Among other problems, the application of legislation affecting mining and the environment was taking place "in a haphazard manner". Mariette Liefferink of the Federation for a Sustainable Environment said that her organisation recognised that mining contributed significantly to GDP but that there was a systematic failure by government to implement legislation. Melissa Fourie of the Centre for Environmental Rights said that acid mine drainage was not unique to South Africa, but that "government officials are paralysed by the enormity of the problem".

The DMR stated in September 2017 that it was in the process of addressing industry concerns about some of the relevant environmental legislation. Some of the new regulations relating to mine closure have been criticised as being excessively stringent and costly. Cobus Loots, chief executive of Pan African Resources, said regulations in their current form would put a strain on finances, leading to retrenchments and closure of companies and threatening the sustainability of the industry.

Mining inevitably changes the landscape. Whether it disfigures it is a matter of opinion. The mine dumps which once surrounded Johannesburg were seen by some people as an attractive feature after grass and other vegetation had been planted on them. Before this happens, the dumps can be ugly. One striking example is to be found along the highway from Johannesburg towards Eskom's Arnot power station some 200 kilometres to the east. Ten or twelve years ago the landscape was largely grassland and maize fields, although the Arnot, Kendal, and Duvha power stations were clearly visible, with Hendrina in the distance. Coal mines around Witbank could also be seen. Today numerous additional coal mines are visible from the road, their dumps often right alongside it. Grass has been planted on some of the dumps, and some mining companies make efforts at rehabilitating the landscape, although it can never be restored to its former attractiveness. Other companies simply pile up their dumps, pollute the water supply, destroy nearby homestead gardens and other vegetation, and then disappear. Attempting to enforce compliance with environmental controls involves lengthy and expensive litigation.

The problem does not stop with inadequate environmental controls by the state and/or failure by companies to comply with the law. Various groups are opposed to coal mining per se on the grounds that it contributes to "climate change".

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It should, however, be borne in mind that although more than 90% of households in South Africa use electricity for lighting, only 81% use it for cooking and only 37% for heating. Nearly two million households burn wood or coal in their own homes, while nearly 1.5 million use gas or paraffin. They too suffer from pollution, and also face risks of fire. More than 6.6 million households have no source of fuel for heating. According to a study published by the IRR in 2016, indoor pollution rather than outdoor pollution is South Africa's "most serious air-quality problem". Indoor pollution accounted for the deaths of 1 400 South African children a year, the study reported.

The provision of electricity as cheaply and speedily as possible to all of the households who suffer from indoor pollution as a result of the fact that they do not have, or cannot afford, electricity for heating and cooking, needs to be a key component of energy policy. This includes additional coal-fired power stations.

According to the *South African Coal Roadmap*, published in 2013 following an initiative of the Fossil Fuel Foundation, Eskom, coal producers, Sasol, and the DMR, all future coal-fired power stations, including those already under construction, are anticipated to have flue gas desulphurisation to mitigate the emissions of toxic gases, even though these requirements will also necessitate the use of more water. The roadmap report also said that mining caused "surface disruption" for a certain length of time. However, "if planned and managed properly, mining pits will be backfilled as mining progresses and should be closed and rehabilitated by the end of the mine's life". The report added, "Very careful planning is required if rehabilitation is to be achieved with minimal possible loss of biodiversity."

ILLEGAL MINING

High unemployment and weak law enforcement have resulted in the growth of a large industry of illegal mining. Much of this takes place in derelict mines, although some of the illegal miners work clandestinely in operating mines. According to some estimates, as many as 30 000 people work in this industry. A large number of these are believed to be illegal immigrants. Many of them are also one-time employees of mining companies. The Chamber has estimated that the annual commercial value of illegal mining and illicit dealings in precious metals and diamonds is more than R7 billion. Some of the output, such as gold, is sold via international syndicates. Other minerals extracted, such as coal, are sold to local communities.

THE FUTURE

Since its establishment 150 years ago, the South African mining industry has faced enormous challenges – political, social, technical, and economic. One way or another, it has overcome most of these – only to be faced with new political, social, technical, and economic challenges. Although none of these can ever be finally overcome, the political challenge is now probably greater than the other three put together. Perhaps the best evidence of this is that the leaders of the industry have become more outspoken about the damaging effect of the Mining Charter and other policies. The Chamber of Mines is indeed challenging the Charter in the courts. Although the change comes too late for companies that have already reduced their exposure to South Africa, the pendulum has swung against the policy of appeasement that has characterised the industry's response to the demands of the ANC government.

How that government will respond to this swing remains to be seen. Some of the industry's objections to regulatory policy and implementation may result in changes. But without an absolutely fundamental improvement in the policy environment, South African mining will continue its slow decline, attracting substantially less investment than the country's resources and technical expertise warrant.

This last section of the paper will look at the potential of South African mining, recent changes in the business climate in which mining companies operate, the particular challenges they face, the views of mining executives, and how much investment can be expected. An appendix will then list some of the projects currently being undertaken or in the pipeline.

> *Some of the industry's objections to regulatory policy and implementation may result in changes. But without an absolutely fundamental improvement in the policy environment, South African mining will continue its slow decline, attracting substantially less investment than the country's resources and technical expertise warrant.*

Potential

Although vast quantities of metals and minerals, precious and base, have been extracted from below the South African landscape, huge deposits remain. According to Citigroup, the treasures beneath the soil are still the richest in the world if oil is left out of the equation. Some years ago Citigroup put their value at $2.5 trillion. This is way ahead of the next three countries on the list, Russia, Australia, and Canada.

Neil Froneman of Sibanye said in May 2016 that previous South African mining companies were "stressed and leaving". His company was buying the assets cheaply. "We see opportunity in South Africa. There are still lots of resources here – lots of gold that has not been mined, platinum reserves still considered the largest in the world, a high quality of skills and infrastructure". A year later – after his company had acquired the Stillwater palladium mine in the United States and renamed itself Sibanye-Stillwater – he reiterated that South Africa was "endowed with an unbelievable mineral resource".

Bernard Swanepoel, at the time chief executive of Harmony, which, like Sibanye, has grown mainly by purchasing old assets of larger companies, said there were very few minerals in which South Africa was not a potential world player. He knew few geologists who did not get excited about the Bushveld complex (which contains not only most of the world's reserves of the platinum group metals, but also plenty of iron, tin, chromium, titanium, and vanadium). The iron ore deposits were the best in the world. "The good news is that the resources are still in the ground. We have lost out on the last boom cycle, but there will be another one."

Srinivasan Venkatakrishnan, chief executive of AngloGold, which continues to divest itself of South African assets, said he is not a "full pessimist" because he has seen "jurisdictions go up and down". Ghana, for example, "has swung 180 degrees in our favour with its new investment-friendly government". According to some estimates there is still as much gold beneath the surface in South Africa as has been mined hitherto.

Despite lobbies both in South Africa and elsewhere that wish to replace coal with wind and solar energy, and despite whatever commitments various governments have supposedly made in the 2015 Paris agreement, a great many countries are planning additional coal-fired power stations. A report published in April 2016 by a group hostile to coal-fired energy said that $981 billion was being, or was to be, invested in coal capacity around the world. *The Times* of London reported in January 2017 that more than 2 400 coal-fired power stations were under construction or being planned. The 2016 PWC survey said "Asia in particular is going to consume vast quantities of coal for electricity generation".

Rodrigo Echeverri, a coal analyst, said at a coal export conference in Cape Town in February 2017 that South Africa should be able to export increasing quantities of coal to both Africa and the Middle East. Exports to Africa should increase from the current level of 4 million tonnes to 38 million by 2030. Mr Echeverri predicted that global demand for coal would rise from its current level of 900 million tonnes to 1 200 million by 2030. July Ndlovu, chief executive of Anglo American's coal division, said in October 2017 that "coal is on the comeback". New markets were emerging in south-east Asia, North Africa, and the Middle East. South Korea and Taiwan were building new power stations, and there were new stations coming in Pakistan as well. Although Anglo is divesting itself of Eskom collieries, this policy does not apply to export mines.

Orion, an Australian company, said there were exceptional deposits of zinc and copper in the Northern Cape. Graham Kerr, chief executive of South 32, said South Africa had the largest basin of manganese, and was well-positioned to supply coal to developing economies. With its reserves of manganese and iron ore, South Africa is a major supplier to China for its stainless steel manufacturing industry. In June 2017, more than 300 explorers, developers, and investors were present at a "junior mining indaba" in Johannesburg – testimony to the interest that still exists in South Africa despite political uncertainties.

> *Despite lobbies both in South Africa and elsewhere that wish to replace coal with wind and solar energy, and despite whatever commitments various governments have supposedly made in the 2015 Paris agreement, a great many countries are planning additional coal-fired power stations.*

Business context

Two broad issues apply here. One is commodity prices. The other is the financial strength of mining companies. These are of course linked. Increases in iron ore and coal prices have thus caused Anglo American to shelve plans to sell off some of its assets in these sectors.

In its *Mine 2017* report, PricewaterhouseCoopers (PWC) said that after years of pulling back on investment, and exploration, the world's largest mining companies were ready to move ahead. They had reduced debt, strengthened balance sheets, and taken the necessary impairments. They found themselves in step with an awakening global demand for most commodities.

Economists at Nedbank had earlier taken the view that mining production in South Africa should improve with the anticipated lift in commodity prices – although some analysts said that the platinum price was not expected to recover until the supply of above-ground stocks had been exhausted. An analyst at Rand Merchant Bank (RMB) reported in the first week of February 2017 that several major mining companies were now producing larger cash flows than when prices were even higher during the previous commodities boom. This was the result of "years of cost-cutting, operational optimising, selling of marginal assets, and capex curtailment". Another RMB analyst said that mining companies were now "very well-positioned" to move forward positively, although junior mining companies would not find it as easy to obtain finance as the bigger ones. In December 2017 an analyst at First National Bank said that the global environment remained "largely supportive" of growth in the South African mining industry despite a moderate softening of prices.

Moody's, one of the international credit ratings agencies monitoring South Africa, said towards the end of 2016 that after years of underinvestment it was time for the gold industry to start spending again now that it was generating cash. BHP, a major global mining company, said that "population growth and the rise in living standards" would push up demand for energy, metals, and minerals for decades to come. New demand centres would emerge as a result of industrialisation and urbanisation in countries such as India.

In December 2017 XMP Consulting said that South African coal exports to several Asian countries had increased in the past three months. Pricing in the local market was reported to be "chaotic" as strong demand from Eskom and industrial customers competed with unexpected global demand.

Policy context

At the time this paper was being written, the High Court had postponed until February 2018 an application by the Chamber of Mines for the third version of the Mining Charter to be reviewed and set aside. The Chamber's objections to the Charter, which was gazetted in June 2017, have been dealt with in various reports published by the IRR. These reports also contain the IRR's own critical analysis of the Charter.

Its key requirements include: applicants for new mining prospecting rights must have a minimum of 50% plus one black shareholding; applicants for mining rights must have at least 30% of their shares owned by black South Africans (as opposed to 26% hitherto); at least 70% of goods required by mines must be procured from local manufacturers; at least 80% of spending on relevant services must go to local firms which are 51% black-owned; and 1% of annual turnover must be distributed every year to black shareholders over and above whatever dividends companies might declare, and over and above whatever other shareholders might receive.

In July 2017 the DMR gazetted a proposal freezing the processing of applications for new mining and prospecting rights. The department also proposed restricting the transfer of mineral rights between companies. The Chamber described these proposals – which were soon abandoned by the minister – as "an unlawful exercise of power".

> *The regulatory environment is one of the reasons why South Africa, despite its resources, ranks so low on the index of attractiveness for mining investment compiled by the Fraser Institute, a Canadian research house. In 2016/2017 our ranking was 74th out of 104 (against 53rd out of 64 in 2004/2005).*

The regulatory environment is one of the reasons why South Africa, despite its resources, ranks so low on the index of attractiveness for mining investment compiled by the Fraser Institute, a Canadian research house. In 2016/2017 our ranking was 74th out of 104 (against 53rd out of 64 in 2004/2005). Jac Laubscher, economic adviser to the Sanlam assurance company, wrote in May 2015 that fixed investment in the mining sector had held up well so far despite policy uncertainty. This was because "existing projects naturally have to continue and ongoing investment is needed to keep up production". However, he said, there had been a "sharp decline in mineral exploration, now standing at a quarter of its level in 2007". In September 2016 President Jacob Zuma said that "investment in exploration and extraction has dropped significantly". De Beers, the diamond mining and trading company on which South African mining was built, has thus stopped exploration in this country altogether.

The regulatory environment is a problem for small as well as large companies. One of the speakers at the junior mining indaba in Johannesburg in June 2017 pointed out that many resources in South Africa were locked in small deposits that would suit a thriving junior mining sector and black entrepreneurship, but that there was no enabling environment to encourage development of these deposits by small companies.

A number of smaller coal-mining companies have nevertheless been able to take advantage of Eskom's requirement that its suppliers be 51% black-owned. This is because some of the larger companies have divested themselves of Eskom-dependent mines, which smaller companies have purchased.

Views of mining companies

These are included here to give an indication of the factors currently guiding, or likely to guide, decisions by such companies on investment in South Africa. The South African mining industry has of course already undergone substantial restructuring. Major companies have long since shifted their primary listings from the Johannesburg Stock Exchange to other stock markets. Some have shifted their headquarters out of South Africa. Many have also reduced the proportion of their income or assets that is dependent on South Africa, a process of divestment from South Africa which continues.

Some mining executives are deeply pessimistic. Brian Gilbertson, chairman of Pallinghurst Resources and one-time chief executive of BHP Billiton, said the "disastrous" Mining Charter was the "final nail in the coffin" of the South African industry and that it vindicated companies' decisions to invest off shore. Even so, one of the companies that has done precisely that, Anglo American, still sees opportunities in this country. In October 2017 its South African deputy chairman, Norman Mbazima, said "Anglo is 100 years old. It was here before apartheid, through apartheid, it is here now, and it will be here through whatever... We are not cutting and running. We have to have long-term strategies that recommit to this country. There is good money to be made in South Africa."

Mr Froneman said in January 2017 that South Africa "may miss out on this next [mining] boom too". It was becoming very difficult, he said a month later, to get shareholder support for growth projects in South Africa. His company could still operate very successfully in South Africa, but would not invest in long-term projects, put up cash, or commit capital as long as the investment climate remained so "investor-unfriendly". Mr Froneman's remarks are particularly significant. As recently as September 2015 he said, "We have put up our hand and said we want to be the new South Africa's mining champion". Sibanye is on the way to becoming that, but the company has grown by acquisitions worth R45 billion rather than by opening new mines.

Bernard Swanepoel of Harmony said in June 2017 that the charter would "make new investment impossible". It "may truly mark the beginning of the end of the mining industry". Roger Baxter of the Chamber said in Perth in September 2017, "It is extremely difficult to get any company investment committee to approve any new greenfields projects in South Africa today".

Bernard Swanepoel of Harmony said in June 2017 that the charter would "make new investment impossible". It "may truly mark the beginning of the end of the mining industry". Two years ago, Mr Swanepoel said that if South Africa failed to convert its mineral rights into successful discoveries, the country would probably not have a mining industry in 20 years' time. Very few of the rights awarded in recent years to junior mining companies were being utilised by their recipients. There was next to no exploration happening. There was also a risk that most of the assets would remain in the ground because there was no funding, investors having been kept away by government policies, regulatory uncertainty, and a hostile labour regime.

Graham Kerr of South 32 said there were many things, such as manganese and coal, that his company could look at in South Africa. However, none of them would attract the company's attention because of "uncertainty around the Mining Charter and issues around corruption". Bruce Cleaver, chief executive of De Beers, said in July 2017 that he would like to explore more in South Africa, but "it is very unlikely we are going to do that when we do not have control of the exploration project and do not have complete certainty of tenure when we move from exploration to mining." The company has suspended its exploration budget in South Africa, where some of its 54 applications for licences have been kept waiting at the DMR for two years.

Roger Baxter of the Chamber said in Perth in September 2017, "It is extremely difficult to get any company investment committee to approve any new greenfields projects in South Africa today". In December 2017 Mark Cutifani of Anglo American, pointed out that South Africa did not have the domestic cash or resources to build the mining industry further. Foreign direct investment was therefore essential. The former head of a major mining company told the writer in 2017 that it would be 20 years before mining once again became a good investment in South Africa.

There are, however, exceptions to some of these views. Cobus Loots, chief executive of Pan African Resources, a smaller company which is investing in gold processing and exploration, said in September 2017 that South Africa was "difficult, but we manage to operate successfully here". He said that the regulatory uncertainty problem needed to be resolved, but that some companies blamed the government where it was not appropriate. Also in September 2017, Errol Smart, chief executive of Orion, the Australian company investing in zinc and copper in the Northern Cape, said he had managed to convince people across the world to put money behind the mine.

Investment trends

According to the South African Reserve Bank, annual gross fixed investment in South African mining has fluctuated since 2008 at between R62 billion and nearly R67 billion (in constant 2010 prices). The figure for 2016 was R63.74 billion. Later figures are not yet available, but it is evident that real growth has been minimal.

Indeed, according to the Chamber, gross fixed investment in mining has been stagnant since 2009 and has declined by 5% over the last three years.

Different figures, using a different year to measure constant prices, appeared in the August 2017 edition of Nedbank's *Annual Capital Expenditure Project Listing*. Unlike reserve bank figures, which record actual investment, the Nedbank study is based on announcements made. Projected capital expenditure for the mining and quarrying sector peaked at R52 billion in 2007 (in constant 2012 prices). The amount to be spent in 2018 is R14.6 billion, while the sum announced for 2019 is R10.7 billion. (Only projects valued at R20 million or more are included in the Nedbank study.)

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The chief economist of the Chamber, Henk Langenhoven, noted in December 2017 that the mining industry's real GDP in 2016 was 2.6% smaller than that recorded in 1994. By contrast, the financial services industry had grown by 168% over the same period. Mr Langenhoven said that the Chamber had recently put the following question to its members: "What if the South African mining sector could get back into the top 25% of investment attractiveness rankings, which is where our potential suggests we should be?" The 16 companies that responded to the survey represented a cross-section of the various commodities and made up the overwhelming bulk of mining production in South Africa.

Using company reports and the Nedbank survey, Mr Langenhoven said that estimated currently planned capital spending in the mining sector stretching over the next four years amounted to more than R145 billion. Potential additional capital expenditure "in a more certain and conducive environment" could be as high as R122 billion. "This means," he said, "capital expenditure on mining projects could be 84% higher than R145 billion. The positive effect on employment creation...would be nearly 48 000 people." These would be in the industry itself. If indirect jobs were added, the total would be 150 000.

The R145 billion worth of investment currently in the system was broken down as follows: platinum group metals 47%, coal 20%, diamonds 14%, chrome and zinc 13%, sand/stone 3.4%, and gold 1.8%.

If some of the Chamber's figures quoted earlier in this paper are applied to the additional 48 000 mining jobs, almost half a million people would benefit from this additional investment. This is because one miner's income feeds ten other people, some of whom live with the miner while others survive elsewhere on his or her remittances. On the average mine wage of R23 147 quoted by Stats SA for August 2017, the 48 000 additional jobs would translate into R13.3 billion in additional annual income. Some of this would be spent in communities surrounding the mines, and some would be sent to families in rural areas. The indirect jobs that the additional investment would create would substantially increase that figure of R13.3 billion.

Mr Langenhoven said that investment in new mines had halved from 2012 to 2016, even before the publication of the third version of the Mining Charter. The Charter would worsen this trend. Much of the planned investment was in fact "stay-in-business" investment. Five companies were not considering any new investment. One was contemplating divesting from South Africa. "They either could not see worthwhile investment opportunities or the adverse environment had resulted in these firms focusing their efforts on other geographies."

Plans and projects

The appendix to this paper lists some of the current and future projects of mining companies operating in South Africa. It relies on press reports, mining company websites, and the Nedbank study. A number of trends are apparent.

The first is continued restructuring. This includes both restructuring of various companies and the restructuring of the industry as companies buy assets from one another. The latest example of the latter is Sibanye's takeover of Lonmin. Sibanye had earlier bought gold mines from AngloGold Ashanti and platinum mines from Aquarius and Anglo American Platinum. Sibanye itself was formed out of old Gold Fields mines. Harmony is taking over a major AngloGold mine for $300 million, as the latter company reduces its exposure to South Africa. Three of Anglo American's coal mines supplying Eskom are also being disposed of to a local company, allowing Anglo to focus on export mines. New "black" companies (for example, Seriti, Scinta, and Siyanda) are among those taking over assets from older companies.

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The second trend is that the total being spent on extending or developing existing mines and opening new ones is almost R134 billion, according to rough estimates made by the IRR on the basis of published information. This figure is slightly lower than the R145 billion produced by Mr Langenhoven, although it was arrived at quite independently.

Some of the R134 billion identified by the IRR has already been spent, and some will be spent over the next few years. The two biggest projects here are the extension of the Venetia diamond mine owned by De Beers and the push towards full mechanisation of the South Deep mine owned by Gold Fields. As far as new projects are concerned, platinum dominates, which is surprising given that the global price has dropped from $2 163 an ounce in February 2008 to $884 today, and in local currency terms from R16 741 to R11 739. The single biggest platinum project is Ivanhoe's Platreef. Royal Bafokeng Platinum and Anglo American Platinum have a major joint project in the pipeline. WeSizwe is also planning a large project. These investments are being planned at a time when, according to Chris Griffith, chief executive of Anglo American Platinum, two thirds of South Africa's platinum mines are unprofitable.

After platinum, where development and new projects total R37 billion, the biggest recipient of expenditure will be coal, with around R32 billion of development or new projects in the pipeline. Anglo American coal accounts for almost half of this, but Exxaro has big plans. South 32 is spending R4.3 billion to extend the life of its Klipspruit colliery by 20 years, but will invest no further in South Africa. It will also house its coal mines in a separate company which would have new owners.

This points to a third trend, which is that a number of smaller companies still see opportunities to pick up assets arising from the departure of bigger ones. One such, Canyon Coal, says it was previously very difficult to get into coal because of the dominance of companies such as Glencore. Wescoal also believes that "acquisition targets continued to present themselves".

The fourth trend is that gold remains the poor relation. Its global price has dropped from a peak of $1 903 an ounce September 2011 to $1 255 in December 2017. Given the decline in the value of the rand, the local currency price has risen slightly over that period from R16 403 to R16 666. Although Taung Gold is hoping to revitalise assets acquired from other companies at a cost of almost R18 billion, no new mines are in the offing for the immediate future. Sibanye's own recent initiatives here have been a deal with DRD-Gold to process its gold-bearing mine dumps. Pan African Resources will also spend on a tailings project, although it will also spend on exploration in Barberton – where gold was first mined commercially.

Although major companies are reducing their exposure to South Africa, a number of foreign investors are still committing funds. The Australian company Orion, for example, is investing in exploration for manganese and iron ore – amazed that not more is going on in South Africa in this field.

A fifth trend is that although major companies are reducing their exposure to South Africa, a number of foreign investors are still committing funds. The Australian company Orion, for example, is investing in exploration for manganese and iron ore – amazed that not more is going on in South Africa in this field.

The process of closing loss-making operations continues, with the result that jobs will be lost as companies focus on mechanisation. Some of the deals between mining companies have been aimed at the acquisition of processing plants. It is also worth noting that foreign companies account for some of the investment taking place. Even so, it is worth reiterating the Chamber's estimate that investment would be R122 billion higher but for the political difficulties confronting the mining industry. We would thus be looking not at R145 billion in the next few years, but at R267 billion. The difference is the economic cost of these difficulties.

CONCLUSION

The National Development Plan (NDP) adopted in September 2012 reported that the South African mining industry had shrunk between 2001 and 2008 by 1% a year, whereas the top 20 mining exporting countries had averaged growth of 5% a year. As noted above, the Chamber said the industry's real GDP was 2.6% smaller in 2016 than it had been in 1994. This represents a colossal loss of wealth.

If the South African mining industry had not shrunk by 1% a year, but grown by 5% a year, as was the case with other major mining countries, South Africa as a whole would be very much richer than it now is. There would have been more jobs not only in mining but in almost every other economic sector. Mining towns would be more prosperous. There would be less poverty in communities in which mining takes place. There would also be less poverty in rural sending areas, including neighbouring states. The government would have collected more in taxes. The country would have earned more in foreign exchange. More foreign investment would have flowed in. Pension funds invested in the mining industry would have been richer.

> *Even though investment is much lower than South Africa's mineral riches warrant, there is still life in South African mining. Time and again the industry has demonstrated the ability to adapt and survive. Whether it is now able not merely to survive but to thrive and grow rests mainly in the hands of a man who cut his teeth as a trade unionist in the mining industry, Cyril Ramaphosa.*

Even though investment is much lower than South Africa's mineral riches warrant, there is still life in South African mining. Crises over costs and slumps in commodity prices are nothing new. Nor is industrial unrest. Time and again the industry has demonstrated the ability to adapt and survive.

The election of Mr Cyril Ramaphosa as president of the ANC at the end of December 2017 and some of his remarks to the conference of the World Economic Forum in Davos the following month caused some mining executives to adopt a mood of cautious optimism. Mr Ramaphosa said in Davos that the Mining Charter would be "thoroughly discussed with key role players so that we find a solution to unlock our mining industry for South Africa to benefit from this boom." Mr Froneman commented, "We have a good feeling and we respect Cyril and we will work together with him." The industry would be "very supportive" but "we would need to see the regulatory environment change".

A leading mining analyst, Peter Major of Cadiz Corporate Solutions, was also cautious. On the eve of the Investing in African Mining Indaba to be held in Cape Town in the second week of February, he said that with high commodity prices and Mr Ramaphosa taking over, there was "a window of opportunity for mining investment in South Africa". High prices, he added, "overwhelm even bad governance and bad policy. But only temporarily. When prices are high, guys will close one eye and look the other way. Just because Ramaphosa is head of the ANC and commodity prices are high, the spin doctors are saying there is a new renaissance in South African mining. But experienced investors know better. I say all this hype is triggered by the metal price."

Although Mr Major said that the current commodity bull market was "just too good to be true", an analyst at Investec Asset Management said that current commodity prices were supported by "solid fundamentals". Moreover, 2018 would see a "synchronous global growth environment" in which "both emerging and developed markets" would perform very strongly.

Mr Ramaphosa cut his teeth as a trade unionist in the mining industry. He cannot influence commodity prices. But, provided he can get rid of Jacob Zuma, he alone in South Africa will have the power to replace the present hostile policy environment with policies that welcome and encourage this vital industry.

APPENDIX

- **Afrimat**, a construction company, recently entered the iron ore market, purchasing the assets of two companies near Sishen in the Northern Cape for R276 million when they were placed in business rescue. Afrimat has concluded a four-year agreement to provide one million tonnes of iron ore to the "massive" Chinese market, and is looking at more acquisitions. Its chief executive, Andries van Heerden, believes that production for both the local and the export market could be increased to 3.5 million tonnes.
- **Anglo American**, which is pursuing a long-term policy of focusing on diamonds, copper, and platinum, has shelved plans to sell all its coal and iron ore mines after earnings doubled in 2016 on cost cuts and rising metal prices. However, Anglo's coal division is in the process of selling three of its collieries (New Denmark, Kriel, and New Vaal) supplying Eskom to Seriti Resources for R2.3 billion. It was reported in September 2016 that Anglo was planning to spend R15 billion expanding coal production from 57 million tonnes in 2005 to between 80 and 85 million tonnes over the next 10 years. Five new projects under consideration at that stage were New Largo, MacWest, Zondagsfontein, Heidelberg, and Elders. It was announced at the end of January 2018 that Anglo would sell New Largo for R850 million to Seriti, the IDC, and a third company, Coalzar. Aimed at supplying Eskom's new Kusile power station, this mine will cost R20 billion to develop. Anglo was evidently reluctant to meet Eskom's requirement that all its coal suppliers be 51% black owned. Following cost-cutting and productivity improvements in South Africa and elsewhere, Anglo's share price has outrun the FTSE world mining index for two years in a row. Anil Agarwal, an Indian mining tycoon, owns 20% of Anglo. South Africa's Public Investment Corporation (PIC) is the next biggest shareholder, with 14.5%.

Anglo American Platinum (Amplats) has cut its workforce, closed shafts, and sold some of its mines in the context of low global platinum prices. It sold its labour-intensive mines around Rustenburg to Sibanye for R4.5 billion in 2016 and will focus instead on shallow mechanised mines.

- **Anglo American Platinum (Amplats)**, which is 80% owned by Anglo American and is the world's largest platinum miner, has cut its workforce, closed shafts, and sold some of its mines in the context of low global platinum prices. It sold its labour-intensive mines around Rustenburg to Sibanye for R4.5 billion in 2016 and will focus instead on shallow mechanised mines, among them Mogalakwena. Amplats has sold its stake in Pandora to Lonmin for between R400 million and R1 billion and its Amandebult resources to Northam for R1 billion to reduce debt. It is selling its Union Mine and its stake in the MASA chrome company to Siyanda Resources for R400 million.
- **AngloGold Ashanti**, the world's third largest gold miner, has been restructuring its South African operations to reduce debt and restore profitability. Its low-cost Moab Khotsong mine (with mothballed Great Noligwa) is going to Harmony for $300 million, while Kopanang has gone to a Hong Kong company for $7.4 million. Savuka has been closed and loss-making Tau Tona will be placed on care and maintenance, leaving AngloGold with one major core South African asset, Mponeng, the world's deepest mine, along with a tailings operation, Mine Waste Solutions. According to Tim Cohen, editor of *BusinessDay*, Mponeng will need huge capital investment in about five years' time. "Everybody knows the gold is down there – AngloGold has about double the known gold resources of any of the largest five gold miners. The problem is that 70% of the cost of mining in South Africa is absorbed by electricity and labour." Ambitious plans for deep-level mining are nevertheless being drawn up.
- **Bauba Platinum** is spending R9.3 billion ramping up the Palabora copper mine in Limpopo to extend its life to 2033 and provide some 20 000 tons of chrome ore per month.
- **Canyon Coal** wants to expand production from 3.5 million tonnes a year to 10 million through the de-

velopment of organic or brownfields projects of recently acquired assets. Production goes to Turkey or Pakistan, or to local buyers, but not to Eskom. The company says that when Glencore dominated South African coal mining, it was difficult for others to break in. But with Glencore less involved now, there was a lot of room to pick up assets.

- **Coal of Africa** (whose name is to be changed to MC Mining) has sold two mines. Holfontein has gone to Taung Gold for $1.9 million. Mooiplaats has gone for R180 million to Mooiplaats Coal Holdings, set up by the new Last Mile Fund. CoA has also bought the Uitkomst colliery in KwaZulu-Natal from Pan African Resources for R275 million. It wants to extend the mining rights for this mine, which expire in 2023, to align it with its remaining lifespan of 17 years. Cash generated by Uitkomst will help CoA to fund some $80 million in development plans for its major Makhado coking and thermal coal project in Limpopo. The company is also looking for another cash-generating asset.
- **De Beers**, 85% owned by Anglo American, is putting its Voorspoed opencast mine in the Free State up for sale. Even though there are still diamonds there, the company was not willing to make the investments necessary to expand the pit to reach fresh ore. De Beers will then have only one major operation in South Africa, the Venetia opencast mine in Limpopo. The company is spending $2 billion to turn this into an underground operation, which will extend production there to 2043. As reported above, DeBeers has suspended its South African exploration budget.

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- **DRDGold**, whose major activity is the extraction of gold from mine dumps on the Witwatersrand and environs, recently entered into a deal with Sibanye, which will acquire a 38% stake in DRDGold for R1.3 billion in return for shifting its tailings dumps into that company.
- **Exxaro**, which describes itself as one of the largest black-empowered South African diversified resource companies, is developing the Grootgeluk mine in the Waterberg to supply Eskom's Medupi station. Exxaro is also spending R3 billion to develop the Thabametsi mine to supply Medupi. The company further plans to spend R3.8 billion on a mine at Belfast in Mpumalanga, most of whose coal will go to the export market. In addition, Exxaro will spend R522 million on development at the Leeuwpan opencast coal mine in Delmas, which will have a lifespan of 10 years. The company's chief executive, Sipho Nkosi, became president of the Chamber of Mines in June 2017.
- **Gold Fields** sold three old South African mines to Sibanye. It spent some $3 billion acquiring the South Deep mine in 2007, now its only South African asset but one of the richest gold mines in the world. Mechanised to a far greater extent than any other gold mine in South Africa, this 2.5 to 3 kilometre deep mine contains enough ore in wide seams to keep it going for the next 50 or 60 years. But Gold Fields is still struggling to bring South Deep to profitability, and will spend R2.3 billion more on development over the next six years. The company does not intend to buy any more mines in South Africa.
- **Great Basin Gold** is conducting a feasibility study for a shallow new gold mine known as the Burnstone project.
- **Harmony Gold**, now one of South Africa's four largest gold-mining companies, is spending $300 million to purchase the low-cost Moab Khotsong mine from AngloGold, along with the neighbouring Great Noligwa mine and related infrastructure. Some 6 500 employees will be transferred from AngloGold to Harmony. Operational since 2006, Moab is the newest underground mine in South Africa. Harmony has cut back production and the workforce at its strike-prone Kusasalethu mine. Only high-grade areas will now be mined, cutting the lifespan of the mine from 20 to five years. Unprofitable underground workings

have been mothballed. Harmony is also taking over AngloGold's interest in the Nuclear Fuels Corporation of South Africa (Nufcor). Almost 15% of Harmony is held by African Rainbow Minerals (ARM), a diversified group which also has interests in platinum, copper, coal, and ferrous metals.

- **Impala Platinum**, the world's second largest producer, said in September 2017 it might have to lay off 2 500 of its 31 000 workers at Rustenburg to cope with low prices and declining production. The company will harvest its older mines aggressively, and then close them without spending any more capital. Mature mines, regarded as the engine room, will be returned to profitability with improvements in productivity. These will help generate cash to bring two new large mines into production, while also financing the purchase of shallow deposits that can be mined mechanically. In October 2017 Impala said it would pay $30 million for a 15% stake in an undeveloped Waterberg deposit, of which 90% is palladium. It has an option to buy a majority stake.
- **Ivanhoe Mines**, a Canadian company, is spending R17.7 billion on its Platreef project, a large mechanised underground mine producing platinum group metals, copper, nickel, and gold on the Bushveld Igneous complex in Limpopo. The project will require a workforce of about 2 200. Ivanhoe's chief executive, Robert Friedland, said two years ago that this mine "would be the largest platinum mine in the world", overtaking Amplats's Mogalakwena.

In December 2017 Sibanye launched a R5 billion takeover bid for Lonmin, which employs nearly 33 000 people. Some 12 600 of these would lose their jobs over the next three years as depleted Lonmin mines would still be closed. The takeover – which still needs to be approved – will give Lonmin control of its own processing facilities instead of having to rely on those of Amplats.

- **Lonmin**, the world's third-largest platinum producer, has raised $1.7 billion via three rights issues to shareholders in the past eight years but has nevertheless continued to operate in what it described as a "capital-constrained environment". The company recently purchased full control of the Pandora mine from two other platinum companies to give it easier access to its Saffy shaft and so defer expenditure on that shaft, budgeted at R1.6 billion. But it needed to spend R1.2 billion on the MK2 extension to its Rowland mine. It also needed to find the money to complete its partially built K4 mine. In December 2017 Sibanye launched a R5 billion takeover bid for Lonmin, which employs nearly 33 000 people. Some 12 600 of these would lose their jobs over the next three years as depleted Lonmin mines would still be closed. The takeover – which needs to be approved by shareholders in both companies and by British and South African competition authorities by February 2019 – will give Lonmin control of its own processing facilities instead of having to rely on those of Amplats.
- **Mooiplaats Coal Holdings**, a consortium of young black professionals funded by various mining heavyweights through the new Last Mile Fund, bought the idle Mooiplaats mine from Coal of Africa for R180 million in 2017.
- **Northam Platinum** says the position of the platinum sector is "precarious" but is confident that platinum will soon run into a supply deficit. The company has a strong balance sheet and well-performing assets. It bought Everest from struggling Aquarius in 2015 for R450 million and Eland from Glencore in 2017 for R175 million. In 2016 the company acquired contiguous resources from Amplats's Amandelbult mine to enable it to extend the life of its Zondereinde mine to beyond 30 years. Its shallow mechanised Booysendal North UG2 mine is being developed on a modular basis, which includes a capital cost of R270 million over three years.
- **Orion Minerals**, an Australian mining company which has acquired the Prieska copper and zinc mine in the Northern Cape previously owned by Anglovaal, is pouring R20 million a month into drilling and has 18 drill rigs in what might be the largest exploration project in South Africa. Metal traders are clamouring for this project to get started in 2020. The company said it was "staggering" that there had been so lit-

tle exploration in the area for 30 years. The resources would have been "pounced on" had they been in Australia. The zinc price is at its highest in ten years.

- **Pan African Resources** wants to invest heavily in exploration in Barberton, where it owns the Fairview gold mine, at which it will start a R100 million project. The company will spend R1.74 billion constructing the Elikhulu retreatment plant at its Evander mine in Mpumalanga to increase gold production. The company sold its Uitkomst colliery to Coal of Africa in June 2017.
- **Petra Diamonds** has just developed a fresh underground mining area near Cullinan, where it is building a new processing plant. It has also invested heavily at the Finsch mine.
- **Resource Generation** is spending R4.5 billion on the Boikarabelo coal mine in Limpopo to serve both local and export markets.
- **Royal Bafokeng Platinum** has spent R7.5 billion on the Styldrift mine near Maseve. It is spending another R1.4 billion to buy the Maseve mine, concentrator, and tailings facilities to the immediate south of Sun City. RBP wants the surface infrastructure of the concentrator at an underground mine to give it easy access to the nearby Merensky reef. In a joint venture with Amplats R11 billion is being spent to extend production at the Bafokeng Rasimore Platinum mine.
- **Scinta South Africa**, which says it is 51% black owned, recently bought Ermelo Mines and the Davel mining right from South 32 for R187 million.
- **Sephaku Fluoride** will sink R1.7 billion into a fluorspar mine near Rust de Winter, north of Pretoria.

> *Seriti Resources, which aims to become "a black controlled broad-based South African mining champion and a coal player of significant size and scale", is buying three established coal mines from Anglo American for R2.3 billion. The purchase will make it the second largest supplier of coal to Eskom.*

- **Seriti Resources**, which aims to become "a black controlled broad-based South African mining champion and a coal player of significant size and scale", is buying three established coal mines from Anglo American for R2.3 billion. The purchase will make it the second largest supplier of coal to Eskom. At the end of January 2018 Seriti and two other companies agreed to purchase Anglo's New Largo for R850 million. The new owners will need to find R20 billion to open up this mine. The chief executive of Seriti is Mike Teke, immediate past president of the Chamber of Mines.
- **Sibanye-Stillwater**, formed when Gold Fields sold off three of its old mines in 2013, is in the process of shifting its vast tailings on the West Rand into DRDGold in return for a 38% stake in that company, which produces about a ton of gold every three months from its tailings on the East Rand and south of Johannesburg. A new processing plant and storage facility will be built to deliver 43 tonnes of gold over the next 15 to 20 years, adding to the 40 tonnes that will come from the Ergo plant near Boksburg over the same period. In November 2017 Sibanye laid off nearly 6 000 miners at its loss-making Cooke shafts, where illegal mining has plagued its operations. The Beatrix West gold mine in the Free State will have to operate profitably or be closed. The company said it had backed away from a decision to close three deep conventional platinum mines in Rustenburg which it had bought from Anglo American. Cost cutting and increasing output had enabled it to save 10 000 jobs. In December 2017 Sibanye launched a R5 billion takeover bid for the whole of Lonmin, whose shareholders will receive an 11.3% stake in Sibanye. The deal would give Sibanye its own smelting and refining capabilities and enable it to leapfrog Impala to become the world's second largest platinum producer. Mr Froneman warned the DMR not to derail the bid. (Earlier in 2017 Sibanye purchased the Stillwater mine in the United States for $2.2 billion.) Although Sibanye is now one of South Africa's largest mining companies, it has grown by acquisition rather than by opening new mines.

- ***Siyanda Resources***, formed in 2004 by black mining engineers and other black professionals, has recently completed one of the biggest manganese mines in the Kalahari basin. The company is acquiring the MASA company and the Union Mine from Amplats.
- **South 32** is keen to extend its Klipspruit mine on the Springs-Witbank coalfield in Mpumalanga at a cost of R4.3 billion. This would extend the life of the mine by 20 years. This is an export mine which also supplies the Duvha power station, and could also supply Kusile, which is still incomplete. The company is also awaiting approval from Eskom to extend Khutala, a mine supplying the Kendal power station. However, South 32, an Australian company, plans to seek new black owners for these two and its third colliery, Wolwekrans.

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- **Taung Gold International**, which is listed in Hong Kong, is hoping to spend $13.38 million on its Evander and Jeanette projects, acquired from Harmony. It is awaiting the necessary licences and is pursuing funding.
- **Vedanta Resources**, whose executive chairman, Anil Agarwal, owns 20% of Anglo American, is investing $400 million in the Gamsberg zinc mine in the Northern Cape managed by Black Mountain Mining. This will bring total expenditure to $1 billion. But an important factor will be the availability of power. The mine is expected to have a life of 13 years.
- **Village Main Reef** will spend R150 million on the Lesego platinum project in a joint venture with the Industrial Development Corporation.
- **Wescoal**, a junior mining and trading company which is 59% black owned and whose biggest customer is Eskom, is completing studies for a coal project at Moabsvelden. The company took over another junior miner, Keaton Energy, in 2017. It says that acquisition targets continue to present themselves.
- **WeSizwe Platinum** is spending R7.9 billion on a new mine on the farms Frischgewaargd and Ledig as part of its Bakubung platinum group metals mine project.

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