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The power of mining: the fall of gold and rise of Johannesburg

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The City of Johannesburg has developed through the entire life-cycle of the mining industry. In its early years, its development was tied to the varying, but generally upward, fortunes of the mining industry. During this time, gold mining in Johannesburg, and along the Witwatersrand, propelled the growth of South Africa's national economy into a phase of self-sustained development, and created an integrated labour market across southern Africa. It also played a key role in shaping the racial oligarchy that dominated South Africa until the fall of apartheid in the 1990s. However, gold was eventually to decline, first in the areas around Johannesburg, and then elsewhere. The growth of Johannesburg, however, continued and the urban economy became increasingly diversified and flexible. This growth seemed divorced from mining but was, in fact, deeply rooted in the history of mining. The mining industry played an intimate role in the development of the manufacturing sector and also in the emergence of financial services; which is currently the leading economic sector in Johannesburg. These economic changes are represented in continuous evolution of the spatial form of the city. Currently the physical legacy of mining is understood mainly in terms of its deleterious environmental consequences, including acid mine drainage, with the long and profound impact of mining on the patterning of urban growth largely forgotten.

Keywords: Johannesburg; mining; gold; labour; urbanisation; economy

> Will the gold-reef last; and the big city and the hiving population that have grown up around it – will these also endure? Or can it be that the Reef is approaching exhaustion, and that all its correlative interests are doomed to extinction? (Chilvers 1948, 222).

For almost the first half of the city's existence, there was a deep anxiety amongst its residents that Johannesburg would collapse when the mines closed. The mines eventually did shut down but the power of mining in Johannesburg is such that it ignited the development of an economy that outlived the mines and continued to grow and flourish.[1]

This contribution focuses on the development of Johannesburg through the full life cycle of the gold mines, and beyond. It shows how Johannesburg – in common with a few other cities in the world such as Melbourne and San Francisco – transcended the boom–bust scenario of a minerals-based economy and evolved into a diverse and competitive agglomeration. It supports the argument of Davis

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(1998), which challenged a conventional view that economies initially dependent on mining inevitably have substandard economic performance in later years.

The analysis focuses specifically on the Central Rand Goldfield, where large-scale, deep-level gold mining first began in South Africa, and where Johannesburg was proclaimed as a mining settlement in 1886. Central Rand is one of seven distinct gold fields in South Africa, and during its long history of productive activity has produced 15% of South Africa's total gold output. Its importance in terms of physical production has however declined progressively – from 80% of total gold output nationally in 1911 to 3% in 1980 and nearly zero currently[2] – but the economic weight of the urban agglomeration it spawned continues to grow.

The development of Central Rand, and then of outlying gold fields along the ridge of hills known as the Witwatersrand, did, of course, do far more than produce the City of Johannesburg. Yudelman (1984, 9) wrote that, 'The major influence behind the telescoped development of modern South Africa – the leap from a fledgling quasi-state to a surprisingly advanced modern industrial state within the space of eighty years – a process that took centuries in Europe – was the South African gold mining industry'. Innes (1984, 69) referred to the development of the gold mining industry as:

> formative, not only in terms of establishing the capitalist relations of production which were to be the basis of subsequent growth in the industry itself, but also in conditioning the form of evolution of wider social relations in the country, including such phenomena as the migrant labour system, the character and form of the state and the system of labour relations.

The analysis here is divided into two sections: 1886–c.1948 and c.1948–2012. There is a clear rationale for the starting date as this was when the main gold-bearing reef of the Witwatersrand was discovered. The rationale for the divide at 1948 is twofold: 1948 is a political watershed as it was the year that the National Party took power in South Africa and introduced its policy of apartheid, but it also roughly marks the commencement of a period in which manufacturing eclipsed mining as the core of the national and local (Johannesburg) economy.

The article brings together a significant existing literature on the mine labour (Wilson 1972, 2001; Crush 1986; Crush, Jeeves, and Yudelman 1991; Yudelman 1984) with work on: the political economy of mining (e.g. Innes 1984) and of Johannesburg (Beall, Crankshaw, and Parnell 2002); and the changing spatial configuration of Johannesburg (Beavon 2004; Tomlinson et al. 2003). It updates this with reference to recent data and analysis on the mining industry and the changing economy of Johannesburg.

1886–1948: The rise of gold and the rise of Johannesburg

The Witwatersrand

When the Witwatersrand gold fields were first opened up in 1886, there was a ready market for gold as the major European economies were tied to a gold standard, and the liquidity of their currencies depended on a ready supply of the metal. The mining of the gold was, however, extremely costly. For although the gold reefs on the Witwatersrand break the surface in small outcrops, they dip steeply into the earth,

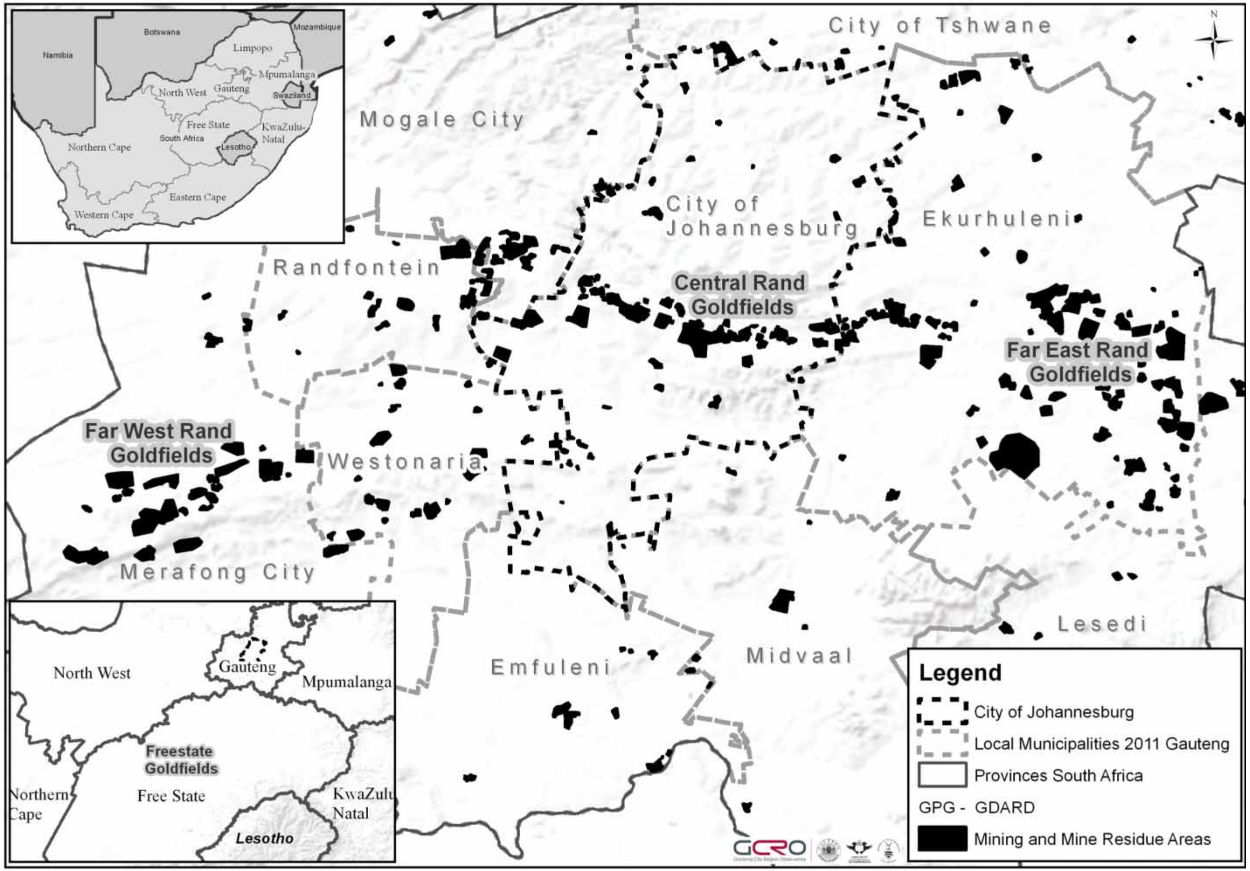

Figure 1. South Africa's gold fields.
Source: Gauteng City Region Observatory (GCRO).

requiring deep-level mining, with expensive technologies, for extraction (Beavon 2004; Innes 1984). It was because of this that a small-scale artisanal mining economy never developed, and that the new gold field was soon dominated by a handful of 'Randlords' who had made their fortunes on the Kimberley diamond fields, and who were backed by international investment capital. These Randlords founded the six dominant mining houses[3] in order to secure the conditions for the continued expansion of mining. A latecomer was the Anglo American Corporation of South Africa, founded in 1917 with capital from the New York bank J.P Morgan. Although there was never to be the same level of concentrated ownership in gold mining as there was with the diamond industry – which was controlled in a near monopoly by the De Beers Corporation – the mining houses established a form of oligarchic control. Ownership became increasingly concentrated as the Anglo American Corporation came to dominate the industry.

Within a decade of the discovery of the gold-bearing reef, the Witwatersrand was the largest gold-producing region in the world. This placed the region at the centre of a major political drama as Great Britain manoeuvred to wrest territorial control of the gold field from the Boer's *Zuid Afrikaansche Republiek* (ZAR) in the Transvaal. The struggle turned violent with full-scale warfare erupting between Great Britain and the two Boer republics in 1899. British forces occupied Johannesburg in May 1900, achieving its objective of economic *and* political dominance of the gold fields. However, in 1906 Great Britain granted autonomy to the Transvaal, which became part of the Union of South Africa in 1910, and the gold fields were thereafter increasingly shaped by South African, rather than British, capital and interests.

Formation of a mining labour force and the South African nation state

There was no guarantee that the gold mining industry on the Witwatersrand would survive. There was a delicate balance between cost and revenue, as the price of gold was fixed, and gold had to be mined at ever deepening levels. White workers arrived mainly from Great Britain and Australia and provided high-level skills, but their labour was expensive. A conventional colonial colour bar protected the interests of these workers by keeping black Africans out of higher-level jobs, but when profits were squeezed, mine owners tried to modify the colour bar and replace white workers with cheaper black African labour (Yudelman 1984).

There was a bitter struggle between white workers and mining bosses when the government agreed to assist the Chamber of Mines in addressing a severe labour shortage after the war by importing around 60,000 Chinese on indentured labour contracts. The Chinese were all repatriated by 1910, forcing the Chamber of Mines to search elsewhere for cheap labour.

From 1896, the Chamber of Mines coordinated the recruitment of black African labour through the Witwatersrand Native Labour Association (WNLA) but it failed to secure an adequate supply of labour from South Africa's 'native reserves' (later the so-called *homelands*). Two-thirds of black African workers in the period from 1910 to 1928 came from the Portuguese East Coast (now Mozambique), but a demand from the Portuguese government that this labour supply be capped compelled the WNLA to recruit further and further afield, in colonial-controlled territories such as Nyasaland (Malawi), Bechuanaland (Botswana), South West Africa (Namibia), Basutoland (Lesotho), Southern Rhodesia (Zimbabwe) and Northern Rhodesia (Zambia) (Innes 1984; Crush, Jeeves, and Yudelman 1991; Crush and James 1991).

Crush, Jeeves, and Yudelman (1991, 1) wrote that 'there is little doubt that if large numbers of low-wage, unskilled migrant miners had not been recruited from throughout the subcontinent, there would never have been a deep-level gold mining industry in South Africa'. The WNLA's labour recruitment tied much of southern Africa to Johannesburg's burgeoning economy, with the authors describing this as 'South Africa's labour empire' (Crush, Jeeves, and Yudelman 1991, 1). This system of labour recruitment was linked to a pattern of oscillating migration in which male workers were housed in single-sex compounds for limited periods, and returned to families in rural areas when their contracts expired. The state was complicit in supporting this system.

With the extensive use of cheap non-South African labour, mining companies were able to keep the lid on costs for a prolonged period (Wilson 2001). In 1921, however, there was a crisis as the price of gold dropped from 111 shillings per fine ounce to 97 shillings. The Chamber of Mines responded by modifying the colour bar and replacing expensive white labour with black African workers. This provoked a bloody rebellion – in which white workers notoriously marched under the banner 'Workers of the World Unite for a White South Africa' – that was ruthlessly suppressed. Two hundred and fifty people died and the white workers' struggle ended. The so-called Pact Government of the early 1920s pacified white workers by legislating the colour bar but otherwise did not act against mining interests. Throughout this formative period, the state played a critical role in supporting the reproduction of low labour costs to ensure the survival of gold mining, which was so central to the development of the national economy (Innes 1984).

Johannesburg's economic foundations

The spectacular growth of Johannesburg in its early years has been recalled in numerous, mainly romantic, accounts of a mining camp burgeoning into a modern metropolis. A few accounts (notably Chilvers 1948 and JSE 1948) provide a sense of how fragile and contingent this development really was. The initial dependence on gold subjected Johannesburg to the immense volatility of financial speculation.

In 1888/89, there was a great speculative boom in which the average value of mining companies increased five-fold, collapsing towards the end of 1889 when mining companies struck pyritic ore at 100 or so metres below the surface, and had no technical means to extract the gold. Johannesburg seemed doomed to a future as a ghost town. The town was saved in 1891 when a method to extract gold using cyanide was developed. This was followed by a surge in gold shares and another wave of property development, until 1895 when markets crashed because of tensions between the British and the Boers. Mines closed during the war but reopened with great optimism in 1902, only to slump again because of a severe shortage of labour (JSE 1948).

The turbulent roller coaster continued, with peaks of optimism and troughs of despair. In 1930, the future of gold mining and of Johannesburg appeared bleak, with South Africa's Chief Mining Engineer predicting the near collapse of gold mining by 1950 (Shorten 1970). In December 1932, however, South Africa reluctantly followed Great Britain and other major economies in abandoning the gold standard, with extraordinary results. Suddenly freed, the price of gold doubled overnight, and continued to rise over the next five years. There was an 'orgy of speculation in gold shares' (JSE 1948, 89), with massive private profit-taking. The boom incentivised prospecting and exploration, which led directly to the next major wave of mining development in the late 1940s (Chilvers 1948; JSE 1948).

After a peak in gold production in 1941, materials and labour were diverted to the war effort and African labour became increasingly militant (Chilvers 1948). The next speculative boom was in 1945, and again in 1948, when high yields from the newly discovered Free State gold field were confirmed (Chilvers 1948, 262).

In all of this, Johannesburg's role in the physical production of gold was declining. Central Rand's production peaked around 1911, when the gold field accounted for 80% of South Africa's output. During World War I, highly profitable mines were opened on the Far East Rand by the newly established Anglo American Corporation, and from 1923 this new gold field eclipsed Central Rand. During the 1930s, the Far West Rand was opened up, and when the Free State gold fields developed, the relative position of Central Rand declined further. Between 1938 and 1949, Central Rand accounted for 34% of national production (Scott 1951; Viljoen 2009).

Johannesburg nonetheless continued to grow in power, economic size and population because the mining companies, and also the stock exchange, were headquartered in central Johannesburg, channelling profits towards the city. This was reinforced by the rise of the Anglo American Corporation of South Africa, which, unlike the London-based Gold Fields of South Africa, was a South African company with headquarters in the centre of Johannesburg. In the 1940s, Anglo American became a multinational, expanding its interest northwards in Africa, with 51% control of the Zambian copper mines. It also gained ownership of the De Beers Corporation in the 1920s, and so held a monopoly over the diamond industry.

Johannesburg experienced a process of diversification beginning in the early twentieth century. The development of the mines created an immediate demand for industrial production such as iron and steel, explosives, construction materials and chemicals. The first major industrial development happened in 1890 when President Kruger granted a concession for the development of an explosives industry to the Nobel Trust. In 1913, a mining and property development company established Union Steel Corporation as South Africa's first steel producer. During World War I, South Africa faced a disruption to its supplies of imported manufactured goods, spurring the country to manufacture domestically. By the end of the war, South Africa had emergent industries in sectors including electricity, steel, engineering, chemicals, construction materials and clothing, and many of these industries were established in and around Johannesburg, where the mines and the growing population provided a ready market (Innes 1984).

There was a direct and continued involvement in the development of industry by the mining sector. Union Corporation, for example, established the South African Paper and Pulp Industries (SAPPI); Rand Mines spawned the Portland Cement Company; JCI owned South African Breweries (SAB); and Gold Fields operated factories producing clothing, metals, chemicals, construction materials and food. Importantly, the mining industry was also central to the development of an electricity producing and distribution industry. In 1906, the Chamber of Mines supported the establishment of the Victoria Falls and Transvaal Power Company to provide electricity to the mines until the Electricity Supply Commission (ESCOM) was founded in 1922.

Tariff protection introduced by the Pact Government from 1924 significantly aided manufacturing, and there was a further surge in the development of import replacement industry during World War II. At the end of the war, manufacturing was as important to the national economy as mining, with its contribution to GDP having risen from 10% in 1918 to 25% in 1945 (Innes 1984).

A tight link existed between mining and tertiary services. From the beginning mining needed large amounts of capital to finance production, and finance houses quickly emerged alongside the mining houses, with interlocking directorships. Banks and building societies were established in Johannesburg from the 1880s (such as the United Building Society, now part of ABSA Bank) or moved their headquarters to Johannesburg (for example, Nedbank and Standard Bank of SA). The formation of the Johannesburg Stock Exchange (JSE) in November 1887, which supported the equity requirements of the mining industry, was also a critically important development in strengthening Johannesburg's position as the centre of South Africa's emergent industrial and business economy.

Johannesburg's spatial expansion

Johannesburg's changing social structure is not dealt with in detail in this article, but one of the most striking social outcomes of mining that must be noted was the city's changing demographic profile. In 1911, there were only 36 females per 100 males, with 77 per 100 for the white population, and only five per 100 for the black African population. In 1946, towards the end of the first period of study, the overall figure was 75 females per 100 males, with 101 for whites and 56 for black Africans.[4] As sex ratios were narrowing, class differentiation was widening. Van Onselen's *New Babylon, New Nineveh* (1982) provides wonderful detail on the emergence of working class cultures in Johannesburg.

The spatial evolution of early Johannesburg was profoundly shaped by the physical presence of mining and by the hierarchies and intersections of a society that emerged around the mines. Johannesburg quickly emerged as the central node in a string of settlements in a nearly 50 km east–west belt along the gold-bearing reefs of the Witwatersrand. The mining belt was a defining physical feature, with settlement on both sides but mainly to the north as the land to the south was underlain by reefs and reserved mainly for future mining activity.

After the discovery of gold, mining claims were pegged out on privately owned farms along the reef, with mining camps spreading out north and south of the diggings. The formal settlement of Johannesburg was however proclaimed on a triangular piece of leftover state-owned land – *uitvalgrond* – immediately north of the mining belt. The settlement was not considered to be permanent and it was laid out crudely on a tight grid with small blocks (Beavon 2004).

Johannesburg had an improbable location and existed only because of a gold reef with uncertain prospects, but the mining camp soon burst into a bustling town with 'banks, shops, hotels and boarding houses, a stock exchange, and the inevitable saloons and brothels' (Beavon 2004, 6). Within 10 years, Johannesburg was the largest urban centre in Africa south of the equator, and its population of 102,000 exceeded that of Cape Town (Chipkin 1993). The trajectory of growth was not smooth, with the brusque fluctuations of the mining economy, and the effects of war and other disturbances, affecting the rate of population and physical growth. During the slump from 1889 to 1891, one-third of the population left the Witwatersrand, and there was another exodus during the South African War (Shorten 1970). By 1928, however, the government had sufficient confidence in the future of Johannesburg to formally proclaim it a city.

The mining boom of the 1930s brought rapid growth to Johannesburg and dramatic urban transformations. This was the time when the inner city went high-rise. Chilvers (1948, 235) notes that 'Buildings were continually being torn down and replaced by modern skyscrapers. Telephones, power, transport just couldn't keep pace with Johannesburg's development. And the pace was getting faster – and faster'. Alongside the control and repression of black settlement in the city, white space was experiencing a massive building boom as over 10,000 apartments were created on the north-eastern edge of the inner city. The rapid development of manufacturing in the 1940s was linked to the emergence of a string of industrial estates along the mining belt and around the edge of the inner city. The tertiary sector, including commerce and finance, consolidated in the inner city (Tomlinson et al. 2003).

The socially and racially segregated and unequal nature of Johannesburg's development has been the central theme in many accounts of the city's development (Guillaume 2001; Beall, Crankshaw, and Parnell 2002; Murray 2008). Beavon (2004) observes that Johannesburg's geography of segregation was apparent from as early as 1887 and that the patterns that shaped almost all future development were firmly in place by 1904.

By 1904, more than 100,000 black Africans, and large numbers of Chinese, were corralled in regimented single-sex compounds on mining property along the Witwatersrand. Initially the compounds were built of iron and wood, but later there were concrete, barrack-like structures with rooms housing 20 to 50 workers each (Crush and James 1991; Crush, Jeeves, and Yudelman 1991). Not all black Africans, however, lived in these compounds. As black Africans entered employment in other sectors, migrants found accommodation in municipal compounds and also in slums in and around the centre of town and in domestic accommodation in white residential areas. This led to the inter-racial proximity that the city council refused to accept, provoking a long history of attempts to segregate the race groups (Parnell and Mabin 1995). The origin of Soweto, for example, was as early as 1903 when the city council moved black Africans living in a slum in present-day Newtown to a remote settlement 16 km south-west of Johannesburg called Klipspruit, ostensibly in reaction to threats of bubonic plague.

From the time of the Native Urban Areas Act, 1923, which prevented black Africans from purchasing or renting land in white areas, the local authority gradually developed segregated housing estates to which black Africans were moved. The whole of the municipality of Johannesburg was proclaimed white by 1933[5] and by the late 1930s the local authority had used the provision of the Slums Act 1934 to clear mixed-race inner city neighbourhoods, and move black African residents to newly built townships such as Orlando. Much of the new township development was situated at some distance south of the mining belt in the area that became Soweto, thus establishing a fundamental divide in the structure of the city (Tomlinson et al. 2003; Beavon 2004). Indian and coloured (mixed race) communities maintained their foothold near the inner city, in places like Fietas, until the apartheid era, when they too were forced into peripheral townships.

By 1904, the wealthy white elite, including the Randlords, were occupying the high-lying ridges to the north of the mining belt away from the dust and noise of the mines, establishing a pattern of wealthy suburban development in a northwards direction. The white mine-workers who had arrived in Johannesburg from abroad lived in small but solidly constructed bungalows in suburbs strung out along the edges of the mining belt; the Jewish migrants from Eastern Europe and the Russian Empire lived in Yiddish-speaking enclaves in the east of the town; the Afrikaners who had arrived from the farms lived in generally poor neighbourhoods in the west of Johannesburg (Chipkin 1993; Beavon 2004). By the 1930s, the city council developed sub-economic housing estates for 'poor whites', often on land where racially mixed slums had been cleared (Parnell 1988). While extreme forms of segregation are generally associated with the system of apartheid, all of this was happening before 1948. The mining industry was a key driver in the increasing levels of urban segregation, and provided the template for the socio-spatial engineering of the National Party government in later years.

Although the dominant representation of Johannesburg has been of a divided and segmented city, recent literature, informed by post-colonialist theory and cultural studies, directs attention to the cross-over and syncrecity that was also a feature of Johannesburg's development (Nuttall and Mbembe 2008; Nuttall 2009; Bremner 2010). In the pre-apartheid era, there were cultural melting pots where new cultural formations emerged. The British, European and Russian immigrants forged a new English-speaking identity in Johannesburg while a creolised African working class identity arose from the inner city slums. There was also racial mixing that persisted into the 1940s despite the local authority's efforts to separate out the various groups.

1948–2012: The decline of gold and the rise of Johannesburg

Gold and labour force fluctuations

By the end of World War II, South Africa still accounted for 40% of the world's total gold output, with the mines around Johannesburg producing about one-third of the national output. The powerful trends away from mining were, however, already in motion.

In 1944, the Allied Nations signed the Bretton Woods Agreement that reinstated the gold standard and pegged the price of gold at US$35 per troy ounce. Once again South Africa was assured of a steady market for its gold, but with a fixed price and rising costs profit margins came under growing pressure. South Africa's gold production peaked in volume in 1970 when it accounted for 78% of global output, but most mines were economically marginal and the future was uncertain (Viljoen 2009).

In 1971, however, the United States unilaterally left the gold standard and the gold price soared to US$800 by 1980, bringing new prosperity to the South African gold mining industry. In spite of a decline in gold production the revenue earned from gold mining climbed dramatically from R830 million to R10 billion. The 1980s were more difficult. The gold price fluctuated between US$300 and US$500, but

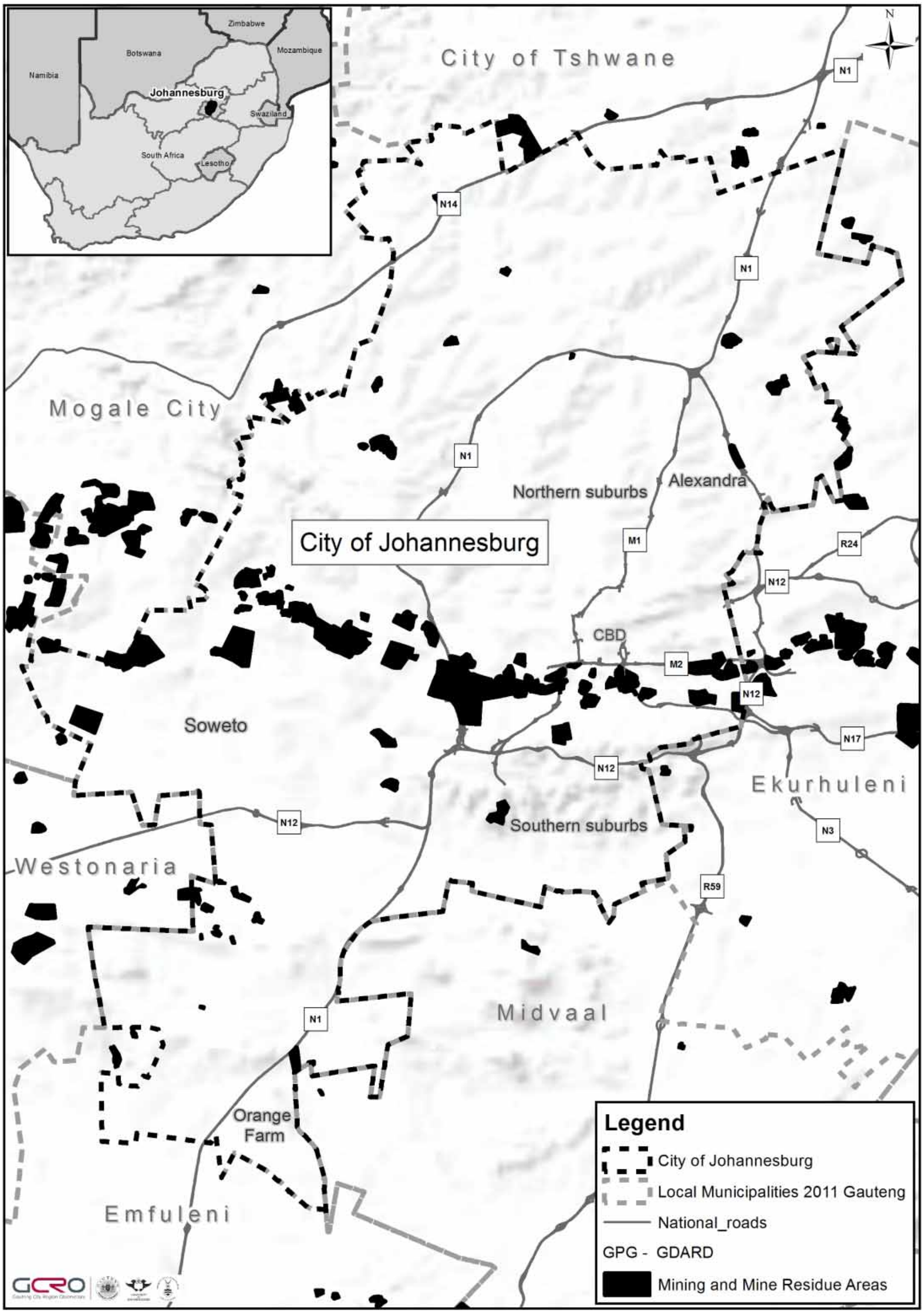

Figure 2. The physical footprint of mining in Johannesburg.
Source: Gauteng City Region Observatory (GCRO).

profits gradually declined, and there was almost no new investment in gold mines (Crush, Jeeves, and Yudelman 1991).

The effects on the labour force were far-reaching. The Chamber of Mines had responded to the cost pressures of the 1960s by expanding the use of foreign labour, with foreign workers accounting for nearly 80% of South Africa's total labour force in 1973 (Innes 1984). In the mid-1970s, however, there was a dramatic change as the colonial government in Mozambique collapsed, abruptly ending labour supply, and as the government of Malawi ordered 120,000 mineworkers to return home (Crush, Jeeves, and Yudelman 1991).

Increasingly, mines had to draw on local labour, and the number of South Africans employed on the mines rose from 87,000 in the mid-1970s to 333,000 in the mid-1980s. Deteriorating conditions in rural South African homelands and the stagnation of the manufacturing economy ensured that there was a strong supply of South African workers. For the first time in the history of gold mining in South Africa there was a surplus of labour (Wilson 2001).

Apartheid was in its final stages, as evidenced by a number of reforms, including: a rapid increase in the real wage of mine workers in the 1970s; recognition for the National Union of Mineworkers (NUM) in 1980; the abolition of the system of influx control into urban areas in 1986; and the lifting of the colour bar in 1988. With mechanisation of the mines there was more demand for skilled labour, and so there was growing talk of the need to 'stabilise' the workforce (Crush, Jeeves, and Yudelman 1991). The system of mining compounds and of oscillating migration did not end, however, with the lifting of influx control. Gold mining companies generally did not follow De Beers Corporation, which had abolished single-sex compounds on diamond mines and provided family accommodation. Instead there was a gradual loss of control over the compounds as families moved in with male workers or found accommodation in burgeoning informal settlements.

Johannesburg and the New South Africa

When South Africa made its transition to democracy in the early 1990s, it was still the world's dominant gold producer, accounting for 44.5% of global output, but difficult days were ahead. In 2010, South Africa produced only 191 tons of gold, 7% of global output, slipping to fifth in the world production rankings (Chamber of Mines 2011).

In the 1990s, mining employment in South Africa fell by 40%, and a further 179,000 jobs were lost between 2001 and 2011. In February 2012, mining production had hit a 50-year low, with the mining sector accounting for less than 5% of GDP. The sector had not only failed to benefit from the commodities boom of the 2000s but was contracting sharply. Gold was worst hit, with a 7% annual contraction in production since 2000, and an 11% decline in 2011 (*Business Times,* 9 June 2012). This deeply constrained the ability of the state to extract rent from the mining sector.

This slump in gold mining has had a severe impact on the economies of gold-producing areas, including towns in the Far West Rand and Free State, but has had no apparent effect on Johannesburg, where other sectors had long since replaced mining. In one sense, the situation in Johannesburg was worse than nationally as the Central Rand Goldfield declined more quickly than elsewhere. By the 1960s, the average profitability per ton of rock mined was only R1.92 for the Central Rand compared with R5.48 for the Far West Rand and R5.59 for the Free State (Cockhead 1970). All the large mines operating on Central Rand[6] shut down by the late 1970s, bringing production on the gold field to a near halt, although the high gold price did allow for the retreatment of old mine dumps (Viljoen 2009). Beall, Crankshaw, and Parnell (2002) calculated that gold mining's share of total employment for Johannesburg fell from 23% in 1946 to 1% in 1996. Very recently, new technologies have made ultra-deep mining feasible and restored the prospect of mining in the Central Rand, but to date efforts to implement the new technologies have not been successful (Seccombe 2012).

To understand the paradox of Johannesburg's continued economic growth despite the collapse of the Central Goldfield, it is necessary to look at the city's position as the economic hub of South Africa's national economy since 1948, which entails its continued role as the corporate rather than physical centre of mining and its continued urban economic diversification supported by the mining companies. The Johannesburg-based Anglo American Corporation, in particular, wielded immense economic power and political influence in South Africa, and was extending its reach internationally (Innes 1984).

In 1999, however, Johannesburg's pre-eminent position in the mining world experienced a setback when Anglo American merged with Minorco and transferred its headquarters and primary stock exchange listing to London. Anglo American did, however, retain a strong presence locally and Johannesburg remains the headquarters of at least seven companies in the Mining Top 100. Johannesburg thus remains a prominent node within a global corporate network of mining firms.

Johannesburg's economy diversified rapidly in the post-war era. In the 1950s and 1960s, manufacturing was the sector that most obviously led growth. Although this put pressure on wage rates in mining, the large mining companies played a dominant role in supporting manufacturing. Anglo American, for example, increased its manufacturing interests in the 1960s by 470% (Innes 1984).

The mines created original demand for industrial products, but a new process was underway in which mining companies expanded into multi-sector conglomerates, with industrial interests not necessarily linked to mining activity. From the 1970s, however, South Africa's manufacturing sector stagnated, and attempts at resuscitation by promoting export-led industrialisation largely failed.[7]

Specialised services, especially finance, took over from manufacturing as the lead sector in the South African economy. Here, too, mining companies played a leading role, becoming a central part of an expanding chain of financial power. Anglo American had significant equity stakes in major banks (Nedbank, Barclays and Standard) and in other financial institutions (such as Eagle Life Assurance) (Innes 1984).

Johannesburg's economic and spatial restructuring

Johannesburg remained at the centre of these economic transformations. Its own economy went through a profound process of change. Mining continued its seemingly inexorable decline. Manufacturing employment grew until around 1980 and then declined sharply thereafter, with its share of Johannesburg's total employment dropping from 24% to 13% in 1996 (Beall, Crankshaw, and Parnell

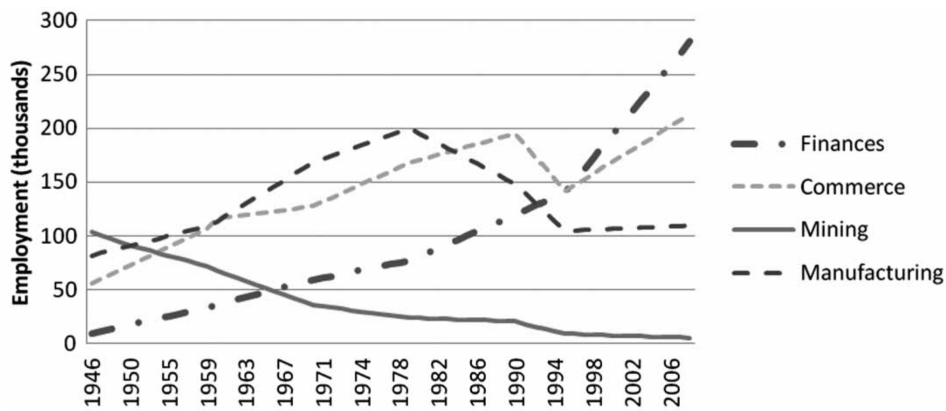

Figure 3. Change in employment by sector 1946–2009, Johannesburg.
Source: Beall, Crankshaw, and Parnell (2002), Quantec.
Data sources: Beall et al. (2002); Quantec

2002; Rogerson and Rogerson 1995). Community, personal and social services grew steadily until around the 1990s and then experienced modest employment decline. It was finance, insurance and real estate that continued growing and eventually outperformed all other sectors.

Initially, the rise of manufacturing more than compensated for the decline of mining and Johannesburg's economy performed well. In the 1980s, however, the decline of both manufacturing and mining took its toll, and Beall, Crankshaw, and Parnell (2002, 33) report 'a negative average annual rate of growth per capital gross geographic product per capita GGP of minus 0.6 percent'.[8]

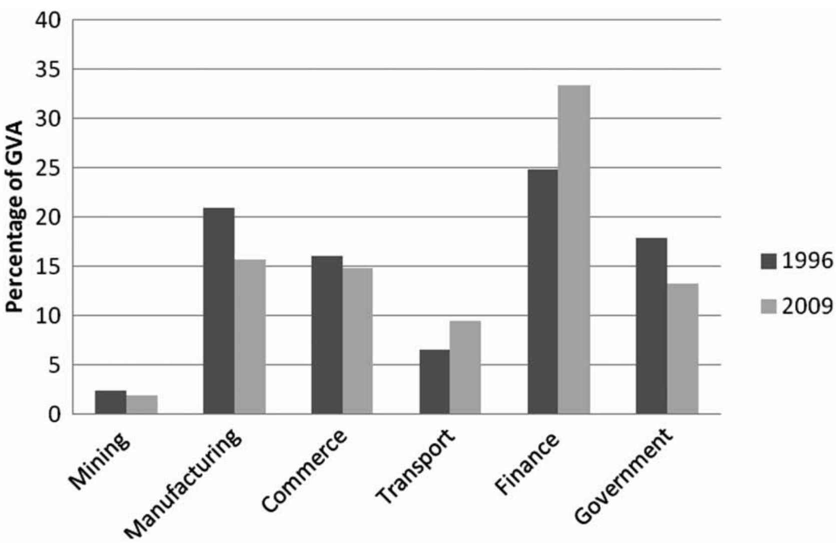

Figure 4. Change in contribution to GVA by sector 1996–2009, Johannesburg.
Source: Quantec.

In the period 1996 to 2009, however, Johannesburg's economy performed well. The local economy grew at an annual average of 4.5% measured in gross value added (GVA). This was higher than the national average of 3.3% and higher than that of any other metropolitan area in South Africa.[9] Johannesburg was consolidating its economic dominance of South Africa.

As Figure 4 shows, mining's direct contribution to GVA in the democratic era is almost negligible, and manufacturing has continued its relative decline, although there has been modest absolute growth. Finance has had the most impact on growth, with its contribution to GVA rising from 24.8% in 1996 to 33.4% in 2009. Johannesburg has emerged as a global service centre in banking, finances and related services (Hamilton 2006). Sassen (2009) ranks Johannesburg as the 22nd city in the world in the 'financial dimension', with a ranking of 8 for 'derivatives contracts' and 10 for 'commodities contracts'.

Present-day Johannesburg, with the economic structure and growth performance of a successful post-primary and post-industrial city, is far removed from its mining origins. However, Johannesburg remains deeply connected to its mining past, with its new flagship sector, finances, having evolved from the financial needs and power of mining.

Spatial transformation of the apartheid city

Although the broad pattern of Johannesburg's spatial pattern may have been established in the early decades, political and economic transformations have had far-reaching effects on spatial configuration. When the National Party took power in 1948 Johannesburg was already a highly segregated city as the city council had cleared most of the racial mixed neighbourhoods by the end of the 1930s and the workforce in the mines was extremely segmented. Apartheid was ruthless and extreme in separating out the remnants of integration, although it ultimately failed in its objective of absolute segregation.

The late 1940s to the early 1970s were the heyday of apartheid and a period of rapid economic growth underpinned by the expansion of manufacturing. This was accompanied by the suburban expansion of white residential areas in the north and south of the city. White suburbia initially developed in areas to the south of the city, ultimately becoming white working class neighbourhoods. The locational impetus for these settlements came less from mining and more from the presence of iron and steel works. It was in this period that the apartheid government developed large segregated townships with no industrial or commercial base for black Africans – most notably the agglomeration of townships that became known as Soweto – and eliminated racially mixed cultural melting pots such as Sophiatown and Western Native Township.[10]

The movement of Africans to the city continued apace and had reached 455,000 by 1948. The workforce for the mines remained in the compounds but there was an involvement of the mining industry in township development. In the 1950s, the founder and head of Anglo American, Sir Ernest Oppenheimer, provided a low-interest loan to Johannesburg City Council to construct 50,000 housing units in Soweto for families who were then living in shanty towns and emergency camps (Beavon 2004). This initiative, which accelerated the development of Soweto, may have represented an early attempt by the mining sector to create a more stable

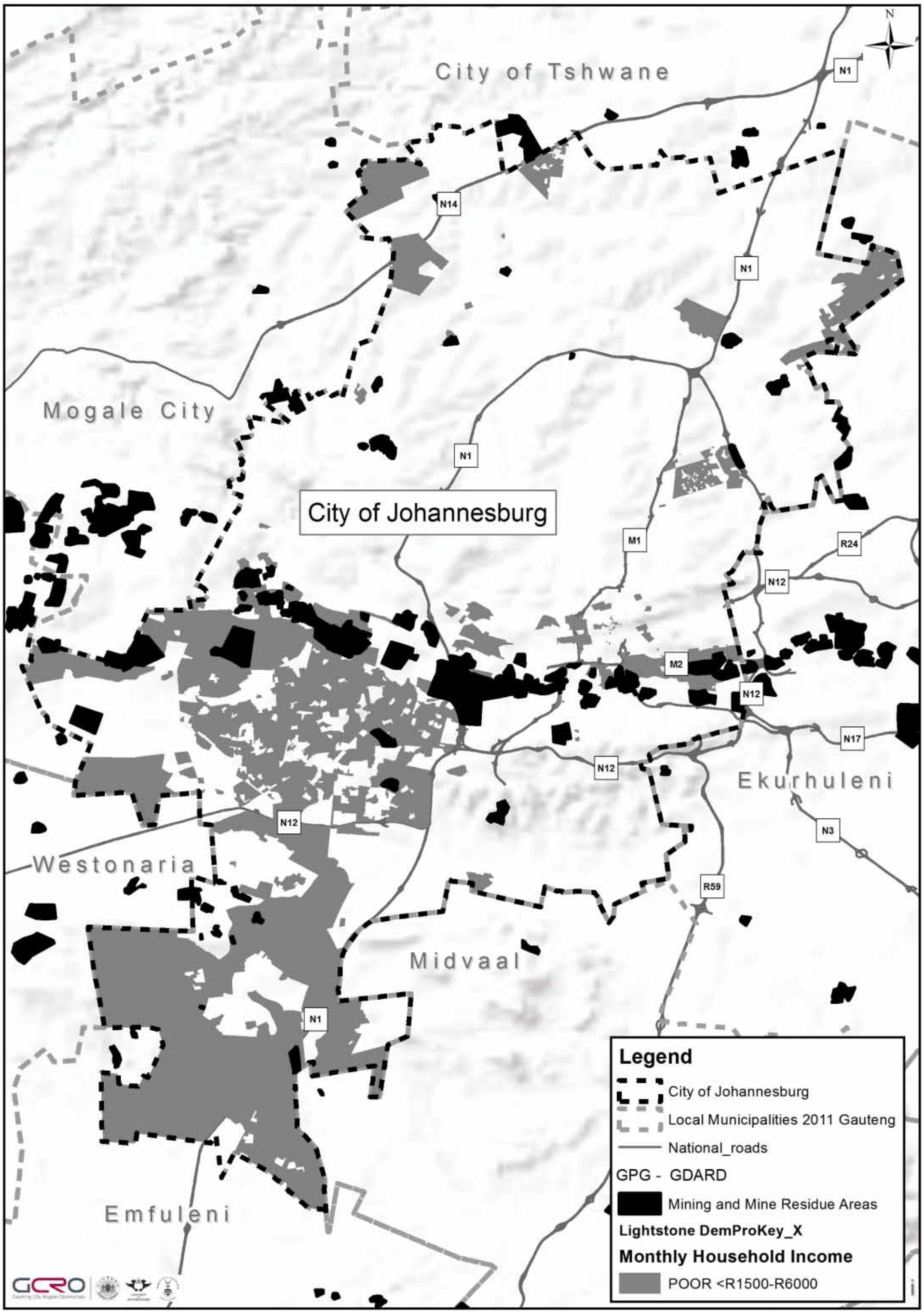

Figure 5. The mining belt in relation to areas of poverty in Johannesburg.
Source: Gauteng City Region Observatory (GCRO).

environment for labour, but it was not followed up in subsequent years. Mining compounds remained almost exclusively the residence of black African mineworkers until the arrival of democracy in the 1990s.

While the state was regulating and structuring the life of black residents, the rapid economic growth – which primarily benefited the white middle class – coupled with the expansion of freeways, supported suburban sprawl to the north of the city. There was a rapid expansion of industrial land around the inner city and along the mining belt as well as near townships with labour supply such as Alexandra. The tertiary sector was also growing, although not yet as dominant as manufacturing, concentrated in the inner city until the 1970s.

From about the time of the Soweto uprising in 1976, Johannesburg entered a new phase in its physical development. With the government having halted its large-scale township development and the system of influx control collapsing, informal settlements and backyard shacks reappeared in the city. After the abolition of influx control in 1986 the government tried to direct new settlement by black Africans to newly created townships such as Orange Farm and Diepsloot on the urban edge as African urbanisation accelerated.

The shift in economic structure from a manufacturing base to the services and financial sectors led to a more diffused spatial form that related to commercial and office decentralisation beginning in the late 1960s. Johannesburg became a sprawling multi-modal urban agglomeration, with private investment happening mainly in the prosperous north. Sandton emerged as the centre of the growing financial services sector, eventually eclipsing the inner city as the core of private sector enterprise in the city.

With the closure of the mines, new land was released for development, but the toxicity of the land and the large number of slimes dams and mine tailings was a major constraint. The largest landowner on the segment of the mining belt in Johannesburg, Rand Mines, established a property development company, which gradually reclaimed land for residential, industrial and business purposes.

Johannesburg in democratic South Africa

The democratic era, from 1994, brought a series of complex transformations to Johannesburg, which represented both change and continuity. As formal business left for the expanding nodes in the northern parts of the city, the private sector invested heavily on the northern frontier, creating new ‘edge cities’. Meanwhile, there were dramatic land use and demographic shifts in the inner city. Informal traders and new immigrant communities from across Africa established a large presence. Against the background of pent-up housing demand in black townships and the rise in both internal and sub-Saharan urbanisation to the city, there was an influx of people occupying abandoned inner city buildings and infrastructure, resulting in over-crowded and distressed living spaces. The first decade of the twenty-first century saw many of these buildings converted to low- to middle-income housing opportunities. The inner city encapsulated the competing forces and complexities of gentrification, decline, housing opportunity and exclusion. At the same time, an emerging black middle class left the townships and moved into previously white suburbs, while state-subsidised housing, largely on the edge of the city, created new ghettoes of poverty.

The physical legacy of mining was reasserted during the post-apartheid period. The continued presence of the compounds was a bitter reminder of the past, with government committed to demolishing them or refurbishing them as family accommodation. Mining companies also agreed to this in the Mining Charter 2003. Implementation of the programme was slow and halting as it competed with the multiple demands for state housing subsidies. While some progress has been made with the 'hostel eradication programme', a number of large hostels remain along the old mining belt.

The rehabilitation and redevelopment of the mining belt accelerated demand for industrial, commercial and residential land, renewing growth of the city since the 1990s. The city administration has proposed an east–west corridor of development to knit together the wealthier north and poorer south, but the development has been driven mainly by the strategies of the mining companies. There is a lingering dispute over the right of a municipality to impose planning controls on mining land, but a recent judgment of the High Court in the Western Cape upheld the right of municipalities to regulate land development on all land within their jurisdiction (Kidd 2011). This, together with a plan to consolidate all mine tailings along the mining belt at a single site, may lead to more coherent land development away from the extremely disjointed patterns at present.

A deep concern currently is the danger of acid mine drainage arising from previous gold mining activity. As water percolates into old mines, slimes dams and dumps it is exposed to pyrites and other sulphides and becomes acidic. As water pumps no longer operate, this acidic drainage gradually rises and eventually spills onto the surface, threatening vegetation, water courses, human health and even the foundations of buildings. There have been belated efforts by government and mining companies to address this threat but the levels of acid mine drainage are still rising and have reached the surface in places (Naicker, Cukrwosja, and McCarthy 2003; Kidd 2011).

Conclusion

In common with a handful of other cities which have survived the boom–bust cycle of a mineral economy, Johannesburg owes its origins to mining. What is also important, however, is the *contingency* of Johannesburg's development. The mining industry in Johannesburg, shaped by considerations ranging from geotechnical to geopolitical, took a political form that had immense consequences for the future development of the city, but also for the shaping of social, political and economic formations and relations across southern Africa and beyond.

The minerals revolution that followed the gold discoveries fuelled far-reaching processes of urbanisation; shaped the nature of labour relations in southern Africa for more than a century; tied the development of communities from the rural parts of South Africa and neighbouring countries to the requirements of mining on the Witwatersrand; and provided the template for socio-spatial engineering of the apartheid government. Johannesburg was originally built to serve the mining industry and this is reflected in its spatial structure.

Mining has faded but Johannesburg has continued growing. Today Johannesburg can hardly be regarded as a mining city. However, the industries and sectors that now dominate Johannesburg's economy are themselves a product of a mining history.

Johannesburg's current status as an emergent global service centre in finance owes much to the historical links between mining and banking.

The extent to which the ills and the virtues of the large and complex urban agglomeration, of which Johannesburg is the core, is owed to mining is poorly understood and rarely acknowledged. In recent years, however, the ghost of the mining past has reappeared with the environmental threats posed by acid mine drainage, and also with some renewed prospects for mining within the Central Rand Goldfield. The future is uncertain but gold mining is unlikely to emerge again as a major economic activity. Johannesburg's economic prospects rest mainly on its ability to consolidate its role as a financial and service centre at a time of global and national economic vulnerability.

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Notes

1. Beavon (1997, 153) first wrote that 'gold . . . ignited the development of Johannesburg'.
2. Figures provided in Viljoen (2009).
3. Consolidated Gold Fields of South Africa, Rand Mines, General Mining, Union Corporation, and Johannesburg Consolidated Investments (JCI) collaborated through the powerful Witwatersrand Chamber of Mines.
4. See the National Population Census reports of 1911 and 1946 available in the national government and legal deposit libraries in South Africa.
5. In response to resistance from black freehold landowners and because the municipality could not provide alternative accommodation for all the Africans that it would need to house, the adjoining areas of Sophiatown, Newclare and Martindale were exempted from the declaration (Beavon 2004).
6. From west to east the mines were: Durban Roodepoort Deep, Rand Leases Mines, Consolidated Main Reef, Crown Mines, Robinson Deep, City Deep, Simmer and Jack.
7. The cause of this decline in performance has been extensively debated, with observers pointing to racial policies which prevented the growth of a black middle class and so restricted the size of the domestic markets, declining productivity and protectionism which prevented a competitive export market from developing (Bell 1995; Kaplan 2010).
8. Comparability of statistics is a problem. Figures for GGP were only provided between 1968 and 1991. Since 1996, private firms (Quantec and Global Insight) provide modelled estimated of economic output for municipalities for South Africa but these boundaries do not coincide with the previous statistical boundaries.
9. Based on figures provided by Quantec.
10. Segregated townships were also built for the Indian (Lenasia) and coloured (Eldorado Park and Ennerdale) groups.

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