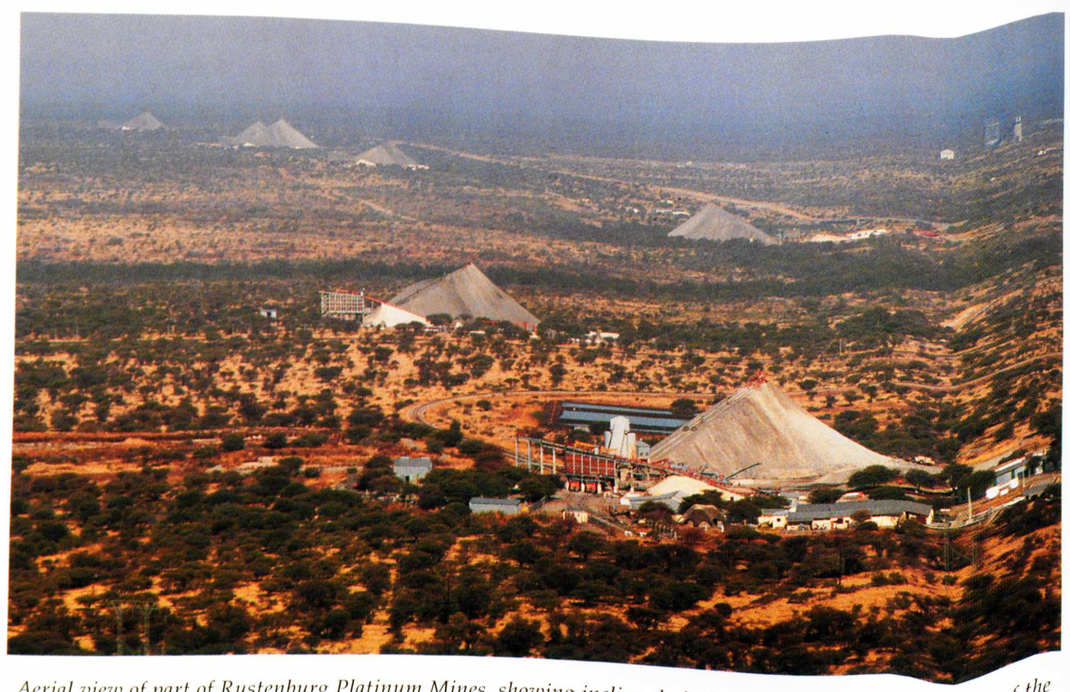
The copper smelter at Noril'sk-Talnakh (courtesy Professor M.J. Viljoen)



Aerial view of part of Rustenburg Platinum Mines, showing incline shafts located along the suboutcrop of the shallowly dipping mineralization, and a vertical shaft sunk to exploit the reefs at depth (courtesy Johannesburg Consolidated Investment Co. Ltd)

leased, although rumour suggests that no viable orebodies have been located. Later reports indicate that Gold Fields may have abandoned the area, since a consortium of the Canadian company Inco and Molopo Australia have started prospecting on a 50:50 basis. According to the 1992 Johnson Matthey Platinum Review, no significant PGM mineralization had been detected by the end of 1991.

The prospecting by Southern Witwatersrand Exploration Company at their Southplats prospect on the Platreef just north of Potgietersrus has already been referred to. An offer of 60 per cent of the issued share capital of Southplats to the Randex company was not pursued. Randex has been investigating the UG2 on two properties at Kroondal, just south of RPM's Rustenburg section. Ore reserves of 9 Mt at a PGM grade of 6 g/t were identified, but the prevailing metal prices precluded any development. Gold Dumps (the original developers of the Crocodile River Mine) also have small holdings in the Rustenburg area underlain by the UG2.

Randex, in partnership with Trojan Exploration, has drilled the Merensky reef below the Bushveld granites to depths of 1700 m near Dullstroom, but failed to find any payable PGM. Rhombus Exploration (possibly a tie-up between RUC mining — jointly owned by Gencor and Murray & Roberts — and an entrepreneur geologist Roy Furie) have holdings on the western part of the farm Zebedelia's Location, adjacent to Messina's prospect. Drilling indicated Merensky sub-outcrop 500 m below surface, but no values have been published. The Severin (Sevmin) group have acquired all the holdings of Southern Sphere Mining and Development Co., adjoining the Kennedy's Vale property of Messina, and possibly also other holdings, and have approached Anglovaal to explore and re-evaluate their holdings. Again, no results have been published. The US Bureau of Mines (US BM) refers (1985) to a mine on the farm Der Brocken in the Dwarsrivier sector, held by Geduld Investments Ltd and East Rand Propriety Mines Ltd, which reputedly has an annual production capacity of 1,44 Mt, but no other details were provided.

Anglo American Corporation (AAC) has decided not to go ahead with its high-tonnage opencast nickel–copper mine at Uitkomst, where the annual by-product PGM output was expected to include 529 kg (17 000 oz) of platinum, 1493 kg (48 000 oz) of palladium, and 187 kg (6000 oz) of rhodium. Recent reports indicate that Anglovaal and its subsidiary Eastern Transvaal Consolidated Mines are investigating a similar prospect on the adjoining farm Slaaihoek, but no results have been published.

3.1.6. South African Production

Table 3.2 provides estimates of the PGM production in South Africa in five-year periods for the period 1926 to 1992. The many sources utilized to compile this table can be found in the references quoted at the end of this work. The total official PGM production figures for the years 1982 to 1992 were kindly supplied by the Minerals Bureau, which has now obtained permission from the mining companies to publish such data. Of considerable interest are the annual growth or decline percentages, which represent the best-fit regression line calculated for the annual production data for the period. However, to eliminate any exponentiality in the regression line, the logarithms of the production figures were used in the calculations, and this applies to all regression data calculated in this report. At a later stage, this report will deal with the underlying reasons for the periodic production growth and decline — suffice to say at this stage that the increased rhodium production in recent years clearly illustrates the increasing production from the UG2 chromitite, and the high price of rhodium on world markets during that period.

It is important to realize that the South African production figures for the PGM are not the same as the actual exports on world markets (Table 3.2). Producers release export PGM depending on demand; sometimes more than actual production, sometimes less. This is particularly true of the 1990–1992 period, when massive selling by Russia caused the South African producers to hold back supplies so as not to cause disruption of prices.

For the years 1976 to 1977, the average contribution of the various PGM producers to the Bushveld's output was estimated to be RPM 57,45 per cent, Impala 36,56 per cent, Western Platinum 4,58 per cent, and Atok 1,41 per cent. Average production figures for Pt + Pd + Rh for 1988 to 1990 show that Rustenburg produced 62 500 kg or 2 009 419 oz (Pt:Pd:Rh = 1:0,44:0,07) at a growth rate of 1,67%/y; Impala produced 48 700 kg or 1 565 739 oz (Pt:Pd:Rh = 1:0,40:0,08) at an annual growth rate of 1,13 per cent; Western Platinum produced 11 500 kg or 369 733 oz (Pt:Pd:Rh = 1:0,57:0,07) at a growth rate of 31,84 per cent; and Lebowa produced 1767 kg or 56 810 oz (Pt:Pd = 1:0,36) and a growth rate of 47,71 per cent. This suggests that the current distribution of the PGM from the Bushveld mines to approximate Rustenburg 50,2 per cent, Impala 39,1 per cent, Western Platinum 9,3 per cent, and Lebowa 1,4 per cent.

3.2. Russia

All PGM production in the Commonwealth of Independent States (CIS) has originated from the Russian republic. The industry commenced in 1823 with the discovery of the Niznhi Tagil (Ural) ultramafics and placers, which up to 1923 had produced, excluding unofficial production, some 253 898 kg or 8 163 000 oz of PGM. Reserves were estimated at between 4,5 Mt and 5,2 Mt at that time, and production estimates were between 100 000 and 200 000 oz per year. Newman (1973) recorded a small production by dredgers, but the grade was a mere 0,31 to 2,8 g/t. This could hardly have been payable, and by now production has probably ceased.

The Petsamo deposits of the Pechenga-Monchegorsk region of the Kola peninsula, discovered in 1937, were initially developed by Inco until 1940, who established 8,5 Mt of ore grading 3,8 per cent nickel, 1,8 per cent