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national accounts

Natural resource accounts

Mineral accounts for South Africa 1980–2001

Statistics South Africa

Report no. 04-05-02 (1980–2001)

NATURAL RESOURCE ACCOUNTS

MINERAL ACCOUNTS FOR SOUTH AFRICA

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PREFACE

This report contains the Natural Resource Accounts (NRAs) in physical as well as monetary terms for three minerals, namely gold, platinum and coal, for South Africa for 1980 to 2001. The report was constructed according to the recommendations of the 1993 System of National Accounts (1993 SNA), as well as the revised System of Integrated Environmental and Economic Accounting (SEEA) of the United Nations. It is presented as a satellite account to the 1993 SNA, which Statistics South Africa (Stats SA) has been implementing since 1995. Satellite accounts provide a framework linked to central accounts, and enable attention to be focused on a certain field or aspect of economic and social life in the context of national accounts: examples are satellite accounts for the environment, tourism or for unpaid household work.

This report is the second report on NRAs published by Stats SA, the first reported on water (Report No. 04-05-01 (2000)), and was published in January 2004. This report follows on the publication of a discussion document on mineral accounts for South Africa in July 2002.

The SEEA defines NRAs as an 'accounting system that deals with stocks and stocks changes of natural assets, comprising biota (produced or wild), subsoil assets (proven reserves), water and land with their aquatic and terrestrial ecosystems. It is frequently used in the sense of physical (environmental) accounting as distinguished from monetary accounting'.

The type of information contained in this report can be used to feed into the development of a national statistics system (NSS). Such a system will ensure that statistics measuring change over time, as kept by different government departments, including Stats SA, can be integrated and made comparable with each other.

The mineral accounts presented in this report will be updated on a periodic basis.

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September 2004

ABBREVIATIONS AND SYMBOLS USED

1993 SNA	1993 System of National Accounts
DME	Department of Minerals and Energy
GDP	Gross Domestic Product
kg	kilogram
mt	million tons
n/a	not available
NRA	Natural Resource Accounts (Accounting)
NSS	national statistics system
R/kg	rand per kilogram
SAMI	South Africa's Mineral Industry
SARB	South African Reserve Bank
SDR	social discount rate
SEEA	System of Integrated Environmental and Economic Accounting
SNA	System of national Accounts
Stats SA	Statistics South Africa
SU-tables	Supply and use tables
t	ton

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INTERPRETIVE SUMMARY

Background

This report contains the first official estimates for the natural resource accounts (NRAs) for minerals in South Africa for the years 1980 to 2001. There were 55 different minerals commodities produced within South Africa in the year 2001[1]. This report covers only three of the most prominent minerals in the country, i.e. gold, platinum and coal. These minerals were chosen because they contribute more than other minerals to South Africa's Gross Domestic Product (GDP). NRAs can be used as an important tool to design policies in order to address key focus areas of government such as sustainable development. NRAs in themselves are not policy documents, but data sets that need to be interpreted and implemented.

These accounts can also be used as a coordinating framework to ensure the numerical consistency of data obtained from various sources, e.g. the South African Reserve Bank (SARB), the Department of Minerals and Energy (DME), the Chamber of Mines, Statistics South Africa (Stats SA) and other research institutions. The data contained in the accounts range from descriptions of the extraction of the resource, changes in inventory (opening and closing stock), estimation of years to depletion of the resource, employment figures and the resources rent to the monetary accounts (resource rent is a measure of the scarcity value of extractive resources in total, whereas unit rent to the scarcity value in unit). These accounts are also important for analysing and evaluating trends in the economy over time.

The aim of this report is not to do a detailed analysis or any policy simulations but rather to construct NRAs for minerals and to give the theoretical background on how this was done. The figures contained in these accounts, however, give some indication of how useful the data can be.

Table A: Condensed physical account for gold: 1980–2001

Years	Production (tons)	Closing stock (tons)	Number of years to depletion
1980	675,1	47 153,2	70
1981	657,7	46 495,5	71
1982	664,4	45 831,1	69
1999	451,3	35 877,0	79
2000	430,9	35 446,1	82
2001	394,8	35 051,2	89

Source: Table 1, page 10

Table A shows that the tonnage extraction of gold declined from 1980 to 2001. It also shows that there is an inverse relationship between production and number of years to depletion; as production drops the number of years to depletion increases. In 1980, for example, production was 675,1 tons and at that time the number of years to depletion was 70 years, whereas in 2001 production was 394,8 tons and the number of years to depletion was 89 years. The same analysis is applicable to platinum and coal (see tables 2 and 3, pages 12 and 14).

[1] www.bullion.org.za

Summary of information in this report

The information contained in this report was collected from 62 coal, 39 gold and 12 platinum mine operations in South Africa. In 2001, the mining sector contributed R67 301 million to the total GDP of South Africa. However, the value added generated by the mining industry decreased at a rate of 1,3% in 2001 compared with 2000. The coal mining industry declined by 0,6%, over this one year time period while gold mining decreased by 7,5% during the same period[2].

Resource and unit rent for platinum and coal increased between 1980 and 2001. Resource rent for coal increased from R352 million to R14 003 million and unit rent from R3 613 million to R62 653 million (see table 6, page 24). Platinum resource rent increased from R457 million to R4 003 million and unit rent increased from R3 997 million to R15 432 million. Output[3] of platinum increased from R851 million in 1980 to R17 311 million in 2001, while coal output rose from R1 497 million in 1980 to R25 859 million in 2001 (see table 5, page 21).

Resource rent and unit rent for gold decreased from R6 913 million in 1980 to R2 029 million in 2001 and from R10 240 million in 1980 to R5 286 million in 2001 respectively. Output and intermediate consumption increased from R10 395 million and R1 554 million in 1980 to R29 011 million and R8 878 million in 2001 respectively.

The total compensation of employees[4] in gold mines increased from R1 448 million in 1980 to R10 904 million in 2001 (see table 4, page 17). There was more employment for women across all mining operations between 1980 and 2001. The ratio of female workers to the total workforce in the three mining operations improved from 1:80 to 1:48 in the gold mines, 1:7 to 1:45 in the platinum mines, and 1:44 to 1:28 in the coal mines (see tables 5 and 6, pages 21 and 26).

The ratio between output and intermediate consumption in the coal mining sector showed an increase from 3:1 in 1980 to 6:1 in 2001. In the gold mines the ratio between output and intermediate consumption was 7:1 in 1980; by 2001 the ratio was 3:1, showing an increase in output and intermediate consumption with intermediate consumptions increasing at a faster rate than output. By contrast platinum mines had a ratio of intermediate consumption to output of 7:1in 1980 and 3:1 by the year 2001 (see table 5, page 21).

[2] Stats SA Statistical Release P0441 – November 2003
[3] For the purpose of this report output is equal to sales, due to data availability.
[4] Compensation of employees will not be equal to other figures published by Stats SA, because such figures are adjusted to benchmarking levels done in 1999, whereas figures in this report are not adjusted.

1. INTRODUCTION

Background

Given the increasing international and local support for good environmental management, based on sound economic principles, the need for NRAs has grown. Over the past three to four decades the conventional System of National Accounts (SNA) has been the source of information for production and disposition of economic goods and services between intermediate use, final consumption and savings, employment of primary factors of production (land, labour and capital), and the creation and distribution of income and wealth within national economies.

The central framework of the SNA has a number of characteristics, which gives it the advantage of an integrated accounting structure. It is exhaustive and consistent within the boundary of the economic activities it covers; that is, each unit, transaction, product and purpose is given a place, and only one, in the classifications and accounts of the system. Moreover, the set of concepts adopted by the system is fully coherent. There are, however, certain limitations as to what may be accommodated directly within such a central framework. Among the major shortcomings of the SNA is its focus on the production and use of manufactured goods and assets that are bought and sold on the market. Excluding the values of environmental amenities, human capital and non-produced natural assets render conventional measures of national income and wealth inappropriate for evaluating long-term welfare aspects and sustainability.

Satellite accounts or systems (e.g. NRAs), as presented in the 1993 SNA, generally stress the need to expand the analytical capacity of national accounting for selected areas of social concern in a flexible manner, without overburdening or disrupting the central system. On the one hand, satellite accounts are linked to the central framework of national accounts, and through them to the main body of integrated economic statistics. On the other hand, as they are more specific in relation to a given field or topic. They are also linked to the information system specific to this field or topic. They call for better integration of monetary and physical data, such as extraction of resources in tons. Because they preserve close connections with the central accounts, they facilitate analyses of specific fields in the context of macro-economic accounts and analyses. Satellite accounts in various fields may, in addition, help to connect analyses between some of those fields. They are thus able to play a dual role, firstly as a tool for analysis, and secondly for statistical coordination.

Typically satellite accounts or systems allow for:

- The provision of additional information on particular social concerns of a functional or cross-sector nature;
- The use of complementary or alternative concepts when needed, including the use of complementary and alternative classifications and accounting frameworks, to introduce additional dimensions to the conceptual framework of national accounts;
- The extended coverage of costs and benefits of human activities;
- The further analysis of data by means of relevant indicators and aggregates; and
- The linkage of physical data sources and analysis to the monetary accounting system.

Statistics South Africa (Stats SA) implemented the 1993 SNA in June 1999 in conjunction with rebasing and benchmarking of GDP estimates. In addition, Stats SA also published the first set of Supply and Use tables (SU-tables), which presents transactions in goods and services in the South African economy in a matrix format for the 1993 reference year in 1999. Subsequent to

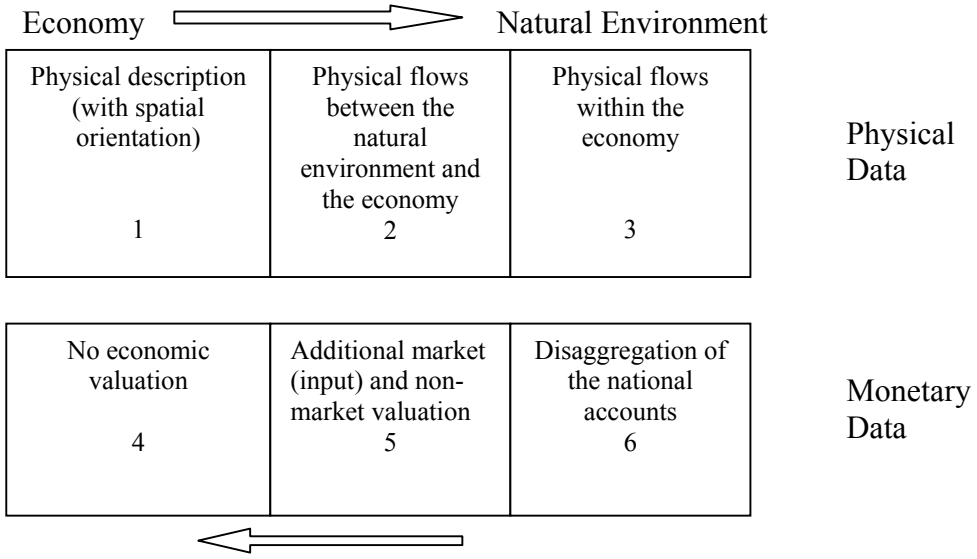
the first SU-tables were published for 1998, 1999 and 2000. As a next step towards implementing the 1993 SNA, Stats SA has now compiled NRAs (satellite accounts) for minerals and water.

Outline of System for integrated Environmental and Economic Accounting

The System for integrated Environmental and Economic Accounting (SEEA) was developed by the United Nations to provide a conceptual basis for implementing a 1993 SNA (satellite) system for integrated environmental and economic accounting. The SEEA describes the interrelationships between the natural environment and the economy. This is achieved by linking the conventional economic accounts with environmental and natural resource accounts. The main purpose of integrated environmental and economic accounting is to support integrated social, economic and environmental policy by means of an integrated information system.

This report gives a background on the exposition of NRAs together with an explanation of the methodology (techniques and method used) followed in the compilation of the mineral accounts for South Africa. A brief overview of three minerals in the South African economy follows. Thereafter the data for the physical, resource rent and monetary accounts are given for the period 1980 to 2001. Stats SA aims to compile a new and/or update an existing NRA every year in future. The compilation of NRA is done in close co-operation with various government and non-government institutions e.g. the DME, the SARB and the Chamber of Mines.

Figure A shows the data sources for integrated environmental and economic accounting.



Where:

1	=	Environmental statistics system in a narrow sense
1 + 2	=	Natural resource accounts and environment statistics in a broader sense
6	=	Economic accounting system (SNA)
2 + 3	=	Material/energy balances
5 + 6	=	Extended economic accounting system
2 + 3 + 5 + 6 + part of 1	=	(Satellite) system of integrated environmental and Economic accounting (SEEA)

Source: System of integrated environmental and economic accounting: SEEA (2003)

The integrated physical and monetary accounts of the SEEA (see figure A) consist of flow as well as asset accounts. Flow accounts are established for products, non-produced raw materials and residuals. Product flow accounts show the supply and use of products in terms of physical units (normally expressed in tons). These data correspond with the monetary values already included in the conceptual framework of the 1993 SNA. Non-produced (raw materials) flow accounts give a picture of the origin and destination of the flows of material inputs from the natural environment to the economy. The flows of non-produced raw materials can be disaggregated by type of material. Residual flow accounts are subdivided according to the destination of residuals, that is, their discharge into the natural environment or into environmental protection facilities.

For asset accounts, opening and closing stock in physical terms should be calculated in so far as the data support the analysis of environmental–economic relationships. Discoveries and volume changes due to natural or multiple causes are shown in monetary as well as physical terms.

Monetary accounting consists of the opening stock, the flows, revaluations and closing stocks. Flows include net natural growth, and losses. Revaluation records the changes in value due to changes in prices at the beginning and at the end of the period.

2. METHODOLOGICAL NOTES

This report focuses on three aspects of natural resource accounts, namely, the development of physical accounts (section 3), the calculation of resource rent (section 4) and the development of monetary accounts (section 5). The latter can only be compiled after resource values have been established.

The interpretation of the monetary accounts over time should be done with caution keeping in mind that it is presented in nominal values. The following methods can be considered to take out some of the perceived volatility:

- change the measuring unit (Rand) to a more stable currency;
- use a GDP deflator; or
- present the values as a ratio to GDP.

2.1 Physical accounts

The format of the physical account starts with the volume (tons) of opening stocks at the beginning of the reference period, to which additions are added and from which extractions are subtracted to arrive at the volume (tons) of the closing stock. In the case of South Africa, the following four entries are included in the physical accounts:

1. Volume sold (in tons);
2. Change in inventories (in tons), (calculated as the difference between the production volume (extraction) and the volume sold);
3. Closing stock (in tons), including change in inventories; and
4. Years to depletion (calculated as the ratio of closing stock over production volume extraction).

Three alternative definitions and measures of the stock (reserves) of minerals are known, namely:

1. Total stock of the mineral.
2. Economically proven reserves defined as that proportion of the mineral resource that is economically feasible to extract.
3. Economically proven reserves, less any possible waste that may occur during the extraction process.

The second measure was used for the South African mineral accounts, as South Africa only has information on economically proven reserves.

Resources are divided into identified resources and undiscovered resources.

Identified resources are specific bodies of mineral-bearing material whose location, quality and quantity are known from geological evidence, supported by engineering measurements. These identified resources are further sub-divided into:

- **Measured resources**: material for which quantity and quality estimates are within a margin of error of less than 20 per cent, from geologically known sample sites;
- **Indicated resources**: material for which quantity and quality are estimated partly from sample analyses and partly from geological projections; and

- **Inferred resources**: material in unexplored extensions of demonstrated resources based on geological projections.

Undiscovered resources are unspecified bodies of mineral-bearing material surmised to exist on the basis of broad geological knowledge and theory. Undiscovered resources are sub-divided into:

- **Hypothetical resources**: undiscovered materials reasonably expected to exist in a known mining district under known geological conditions; and
- **Speculative resources**: undiscovered materials that may occur in either known types of deposits in favourable geological settings where no discoveries have been made, or in yet unknown types of deposits that remain to be recognised.

It is important to note that the mineral accounts only account for identified resources.

There are three ways to estimate the lifetime of reserves (years to depletion) on the basis of current year information:

1. Stock at the beginning of the year / extraction of the year.
2. Stock at the beginning of the year plus appearances / extraction of the year.
3. Stock at the end of the year / extraction of the year.

Option three was used to calculate the years to depletion for minerals in the compilation of the mineral accounts for South Africa.

2.2 Resource rent

Resource rent is a measure of the scarcity value of extractive resources, such as minerals, as their finite stocks are reduced with extraction. Calculation of resource rent is therefore the first step in developing monetary accounts. The method defined in the 1993 SNA was adopted to calculate resource rent for South Africa's mineral accounts. Accordingly, resource rent for each mineral are calculated as follows:

Value of output (at producer prices) minus production costs

Production costs include the cost of intermediate inputs in mining, compensation of employees, consumption of fixed capital, and a normal rate of return on investment capital. The normal rate of return on fixed capital investments is the opportunity cost or economic value of financial capital that may be invested in alternative profit-making economic activities. The average long-term nominal interest rate minus the prevailing interest inflation rate is used as the rate of return to capital, which is multiplied by the fixed capital stock in mining to derive estimates of normal profits.

The average real rate of interest in South Africa was -2,0 % for the period 1973 to 1982 and 3,3% for the period 1983 to 2001[5]. A social discount rate (r) of 3,0% and an alternative discount rate of 5,0 % were used for calculations of the resource rent tables (see table 4, page 17). Average rather than marginal costs were used in calculating resource rent. The unit rent (Rt) was calculated as total rent divided by the volume of depletion for a specific year. Due to a lack of data regarding intermediate consumption for platinum, and consumption of capital and opportunity cost of capital for the platinum mining sector, these variables were calculated as

[5] Percentages obtained from unpublished data from the South African Reserve Bank

percentages of output (derived from ratios of gold). Replacement values were used for the consumption of capital and fixed capital stock and the time series data (1980–2001) is shown in Annexure A.

2.3 Monetary accounts

The three approaches to calculate monetary accounts are discussed in detail in this section, namely:

1. Using environmental expenditure. This is the most common approach in most industrialised economies, reflecting the prime concern about pollution and environmental quality in these countries. This approach works within the existing structure of the 1993 SNA, leading to minor modifications, especially in definition and classifications of income and expenditure entries.
2. Using natural asset depreciation. This approach has been mainly adopted on marketed natural resources such as subsoil assets, timber and fisheries.
3. Full environmental accounting. This represents an attempt to accommodate all entries of the more comprehensive physical resource account in the 1993 SNA with money values assigned.

Based on the sets of data available in South Africa, option number three was adopted for calculating monetary accounts. Closing stock or resource asset (at the end of the period) in the monetary accounts for minerals resources in South Africa is calculated as follows:

	Value of opening stock (equal to the value of the closing stock of the previous year)
Less	Value of the depleted stock (valued at the unit rent multiplied by the volume of depletion)
Plus	Value of new discoveries, additions and other volume changes (valued at the changes in the present value due to the increase in the number of years over which production can go on at current extraction rates given these new volumes)
Plus	Any revaluation due to time passing (valued by discounting for one year less)
Plus	Nominal holding gain (calculated as a residual)

The following formula was used to calculate the value of the stock of the mineral resource at period t as equivalent to the present value of the discounted expected future stream of net economic benefits from the resource over its remaining production cycle (e.g. until depletion at terminal time N):

$$V_t = R_t * q_t * \frac{(1+r)^N - 1}{r*(1+r)^N}$$

$$N_t = Q_t / q_t$$

Where:

- V_t is the value of the stock at the close of period t
- R_t is the unit rent at t
- q_t is the volume of extraction at t (from the physical accounts)
- Q_t is the volume of the stock at the close of t (from the physical accounts)
- r is the social discount rate
- N is the remaining number of years during which extraction can take place at the current rate (calculated as the volume of the closing stock divided by the current extraction volume).

The compilation of monetary accounts therefore presupposes the calculation of resource rent, unit rent (Rt) as well as the number of years to closure at current extraction rates (N). Rates of extraction as well as discount rates are usually assumed to remain constant over the production cycle.

3. PHYSICAL ACCOUNTS FOR THE SOUTH AFRICAN MINING INDUSTRY

This section gives the physical accounts for South Africa's three most prominent minerals, gold, platinum and coal, as they are the major contributors to the country's GDP.

3.1 Gold

Table 1 (page 10) shows the physical accounts for gold in South Africa from 1980 to 2001. Gold production (extraction) declined over this period from 675,1 tons in 1980 to 394,8 tons in 2001. At current extraction rates gold reserves in South Africa were estimated to last another 89 years in 2001 (see table 1 and figure 1, pages 10 and 11).

The closing stock data in the physical account (column 6 of table 1) is the proven economic reserve for gold in 2001. The figure used to calculate opening stocks for 2000 (i.e. the closing stock of 35 877,0 ton for 1999) was obtained from a study done by John Handley at the University of Witswatersrand for a doctoral degree (Handley, 2000). This figure was also used to calculate closing stock for the years before and after 1999, as there were no alternative data available. Closing stocks for platinum and coal (63 080,3 and 55 333,0 tons respectively) for 1999 obtained from this study were also used in the calculation of opening stock for 2000 for these two minerals (see table 2 and 3, pages 12 and 14).

Opening stock for 2001 was the same as the proven economic reserve (closing stock sub-soil assets) for gold in 2000 (35 446,1 tons). That figure (opening stock 2001) minus the production (extraction) of gold for 2001 (394,8 tons) is equal to the closing stock for 2001.

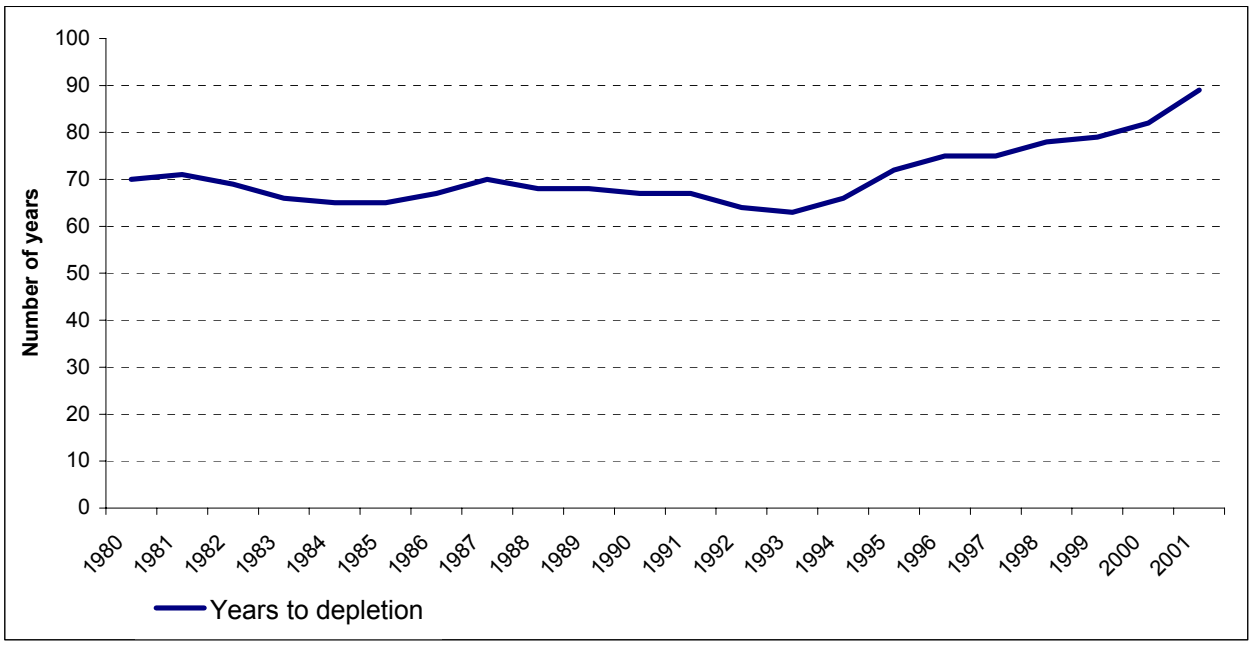
Table 1: Gold: Physical accounts for South Africa: 1980–2001

Year	Opening stock (tons)	Production (extraction) (tons)	Discoveries (tons)	Other volume changes (tons)	Closing stock (sub-soil assets) (tons)	Volume sold (tons)	Net change in inventories (tons)	Closing stock (incl. Inventories (tons)	Number of years to depletion
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1980	47 828,3	675,1	n/a	-	47 153,2	674,8	0,3	47 153,5	70
1981	47 153,2	657,7	n/a	-	46 495,5	661,1	-3,4	46 492,1	71
1982	46 495,5	664,4	n/a	-	45 831,1	661,9	2,5	45 833,6	69
1983	45 831,1	679,7	n/a	-	45 151,4	669,2	10,5	45 161,9	66
1984	45 151,4	681,9	n/a	-	44 469,5	685,1	-3,2	44 466,3	65
1985	44 469,5	672,9	n/a	-	43 796,6	677,5	-4,6	43 792,0	65
1986	43 796,6	640,0	n/a	-	43 156,6	642,1	-2,1	43 154,5	67
1987	43 156,6	604,3	n/a	-	42 552,3	602,0	2,3	42 554,6	70
1988	42 552,3	619,9	n/a	-	41 932,4	618,0	1,9	41 934,3	68
1989	41 932,4	607,7	n/a	-	41 324,7	605,9	1,8	41 326,5	68
1990	41 324,7	605,1	n/a	-	40 719,6	595,8	9,3	40 728,9	67
1991	40 719,6	601,0	n/a	-	40 118,6	601,4	-0,4	40 118,2	67
1992	40 118,6	613,0	n/a	-	39 505,6	613,0	0,0	39 505,6	64
1993	39 505,6	619,3	n/a	-	38 886,3	619,0	0,3	38 886,6	63
1994	38 886,3	580,2	n/a	-	38 306,1	580,2	0,0	38 306,1	66
1995	38 306,1	523,8	n/a	-	37 782,3	524,1	-0,3	37 782,0	72
1996	37 782,3	498,3	n/a	-	37 284,0	496,2	2,1	37 286,1	75
1997	37 284,0	490,6	n/a	-	36 793,4	507,9	-17,3	36 776,1	75
1998	36 793,4	465,1	n/a	-	36 328,3	464,8	0,3	36 328,6	78
1999	36 328,3	451,3	n/a	-	35 877,0	456,8	-5,5	35 871,5	79
2000	35 877,0	430,9	n/a	-	35 446,1	407,6	23,3	35 469,4	82
2001	35 446,1	394,8	n/a	-	35 051,2	388,0	6,8	35 058,0	89

n/a: not available
See section 2, methodological notes, for definition of the variables
Source: Department of Minerals and Energy (SAMI 1999/2000 and Statistical Tables 1980–2001)

Table 1 shows that output produced for gold dropped from 675,1 tons in 1980 to 394,8 tons in 2001, which is the lowest level of production in the past 21 years. Due to the reduction in production, the years to depletion increased from 70 years in 1980 to 89 years in 2001. Gold reserves in South Africa dropped from 47 153,2 tons in 1980 to 35 051,2 tons in 2001.

Figure 1: Gold: Estimated number of years to depletion for South Africa: 1980–2001



Source: Department of Minerals and Energy (SAMI 1999/2000 and Statistical Tables 1980–2001)
Calculations done by Stats SA

Figure 1 shows the estimated number of years to depletion in the production of gold for the period 1980 to 2001. In 1980, years to depletion were 70 at a production rate of 675,1 tons, and in 2001 reached its maximum level of 89 years at a production rate of 394,8 tons.

3.2 Platinum

Table 2 (page 12) shows the physical accounts for platinum in South Africa from 1980 to 2001. Platinum production (extraction) increased over this 21-year period from 114,3 tons in 1980 to 129,8 tons in 2001. At 2001 extraction rates, platinum reserves can last for another 484 years (see table 2 and figure 2, pages 12 and 13).

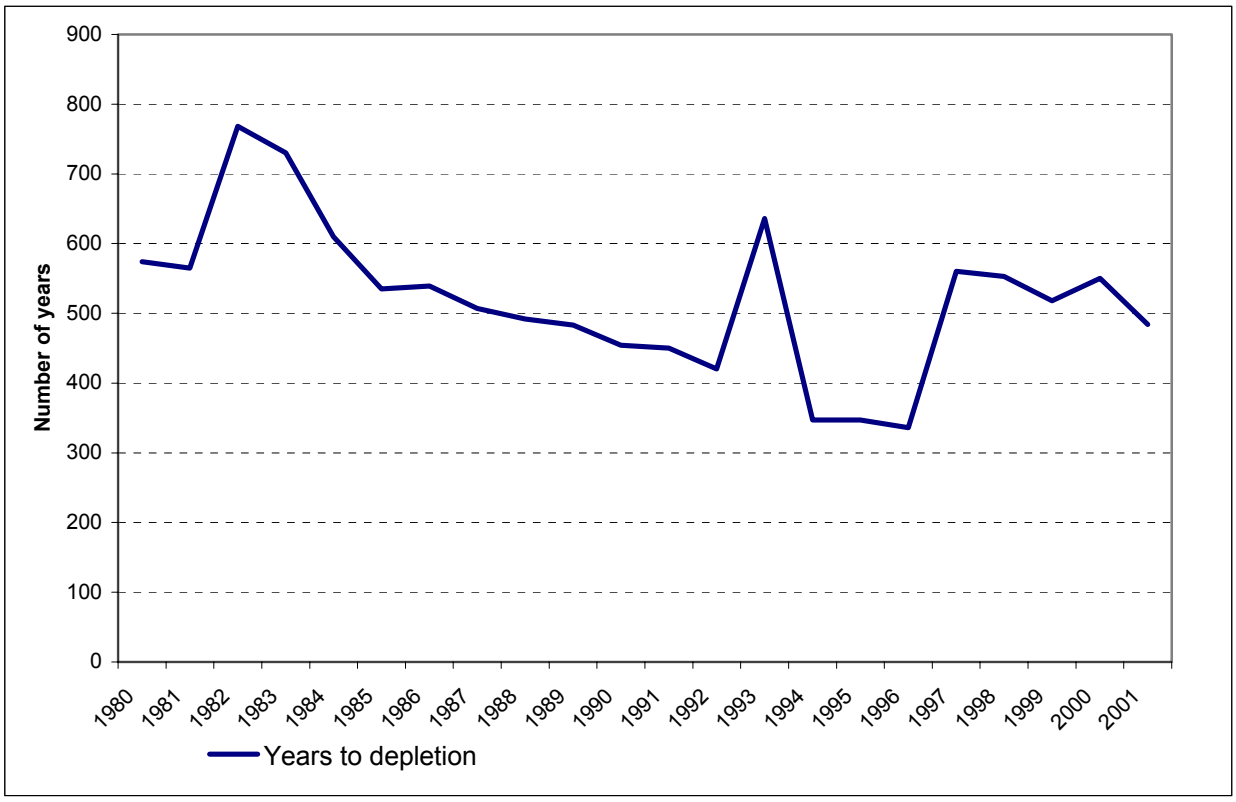
The closing stock data in the physical accounts (column 6 of table 2) is the proven economic reserve for platinum in the period 1980 to 2001. Opening stock for 2001 was 62 965,9 tons, the same as the proven economic reserve (or closing stock) for platinum in 2000.

Table 2: Platinum: Physical accounts for South Africa: 1980–2001

Year	Opening stock (tons)	Production /extraction (tons)	Discoveries (tons)	Other volume changes (tons)	Closing stock (sub-soil assets) (tons)	Volume sold (tons)	Net change in inventories (%)	Closing stock (incl. Inventories (tons)	Estimated number of years to depletion
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1980	65 746,1	114,3	n/a	-	65 631,8	112,1	2,2	65 634,0	574
1981	65 631,8	115,9	n/a	-	65 515,9	103,5	12,4	65 528,3	565
1982	65 515,9	85,2	n/a	-	65 430,7	98,2	-13,0	65 417,7	768
1983	65 430,7	89,5	n/a	-	65 341,2	103,5	-14,0	65 327,2	730
1984	65 341,2	107,0	n/a	-	65 234,2	112,5	-5,5	65 228,7	610
1985	65 234,2	121,7	n/a	-	65 112,5	118,1	3,6	65 116,1	535
1986	65 112,5	120,5	n/a	-	64 992,0	120,4	0,1	64 992,1	539
1987	64 992,0	128,0	n/a	-	64 864,0	130,1	-2,1	64 861,9	507
1988	64 864,0	131,7	n/a	-	64 732,3	130,9	0,8	64 733,1	492
1989	64 732,3	133,7	n/a	-	64 598,6	137,3	-3,6	64 595,0	483
1990	64 598,6	141,9	n/a	-	64 466,7	135,6	6,3	64 463,0	454
1991	64 456,7	142,9	n/a	-	64 313,8	141,1	1,8	64 315,6	450
1992	64 313,8	152,9	n/a	-	64 160,9	137,1	15,8	64 176,7	420
1993	64 160,9	176,2	n/a	-	63 984,7	153,7	22,5	64 007,2	363
1994	63 984,7	183,9	n/a	-	63 800,8	162,2	21,7	63 822,5	347
1995	63 800,8	183,1	n/a	-	63 617,7	175,2	7,9	63 625,6	347
1996	63 617,7	188,6	n/a	-	63 429,1	184,0	4,6	63 433,7	336
1997	63 429,1	112,9	n/a	-	63 316,2	109,6	3,3	63 319,5	561
1998	63 316,2	114,2	n/a	-	63 202,0	115,1	-0,9	63 201,1	553
1999	63 202,0	121,7	n/a	-	63 080,3	119,9	1,8	63 082,1	518
2000	63 080,3	114,4	n/a	-	62 965,9	118,1	-3,7	62 962,2	550
2001	62 965,9	129,8	n/a	-	62 836,1	126,0	3,8	62 839,9	484

n/a: not available
See section 2, methodological notes, for definitions of the variables
Source: Department of Minerals and Energy (SAMI 2000/2001 and Statistical Tables 1980-2001)

Figure 2: Platinum: Estimated number of years to depletion for South Africa: 1980–2001



Source: Department of Minerals and Energy (SAMI 1999/2000 and Statistical Tables 1980-2001)
Calculations done by Stats SA

Figure 2 shows that the estimated number of years to depletion for platinum, based on declined over the 21-year period shown in the graph from 574 years in 1980 to 484 years in 2001. In contrast to other minerals, the years to depletion do not follow a smooth trend in the case of platinum products. The irregular movements are attributed to the substantial decrease in the production/extraction of platinum in 1982/83 as well as a sharp drop in extraction since 1997.

3.3 Coal

Table 3 (page 14) shows the physical account for coal in South Africa from 1980 to 2001. Coal production (extraction) increased over this period from 115,0 million tons in 1980 to 223,5 million tons in 2001. At current extraction rates coal reserves in South Africa can last for another 246 years (see table 3 and figure 3, pages 14 and 15). This means that years to depletion decreased from 511 years in 1980 to 246 years in 2001.

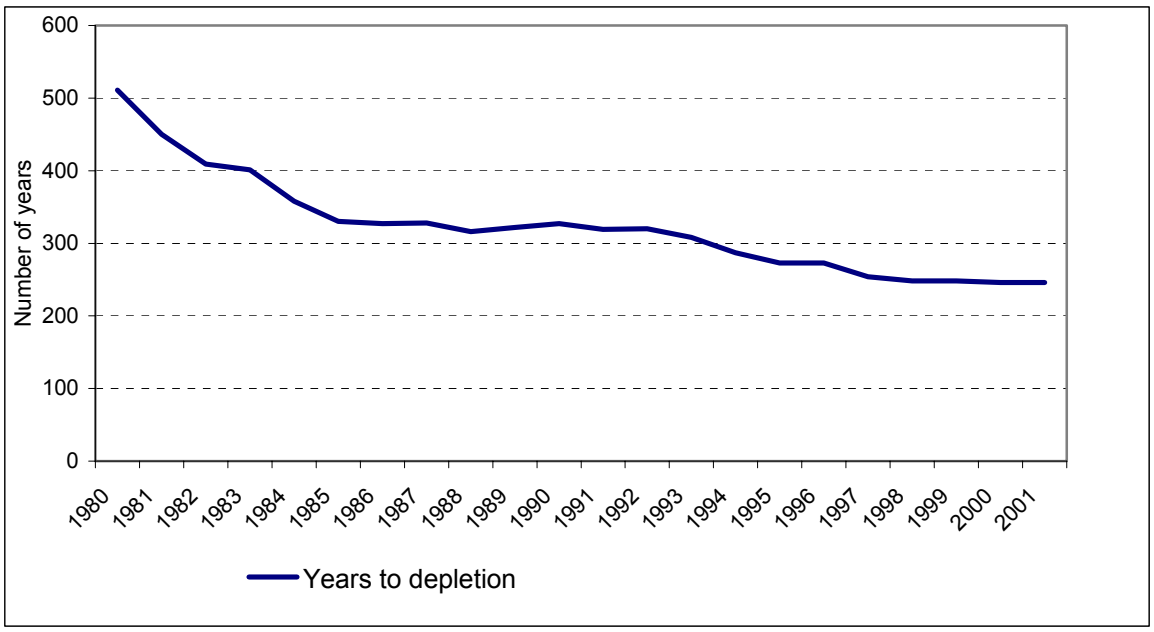
The closing stock data in the physical accounts (column 6 of table 3) is the proven economic reserve for coal in the period 1980 to 2001. Opening stock for 2001 (55 108,1 million tons) is the same as the proven economic reserve (closing stock) for coal in 2000 (55 108,1 million tons).

Table 3: Coal: Physical accounts for South Africa: 1980–2001 (million ton)

Year	Opening stock (tons)	Production /extraction (tons)	Discoveries (tons)	Other volume changes (tons)	Closing stock (sub-soil assets) (tons)	Volume sold (tons)	Net change in inventories (%)	Closing stock (incl. Inventories (tons)	Estimated number of years to depletion
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1980	58 906,4	115,0	n/a	-	58 791,4	113,1	1,9	58 793,3	511
1981	58 791,4	130,3	n/a	-	58 661,1	129,9	0,4	58 661,5	450
1982	58 661,1	143,0	n/a	-	58 518,1	140,3	2,7	58 520,8	409
1983	58 518,1	145,6	n/a	-	58 372,5	144,6	1,0	58 373,5	401
1984	58 372,5	162,8	n/a	-	58 209,7	161,3	1,5	58 211,2	358
1985	58 209,7	175,9	n/a	-	58 033,8	171,9	4,0	58 037,8	330
1986	58 033,8	176,8	n/a	-	57 857,0	174,3	2,5	57 859,5	327
1987	57 857,0	176,1	n/a	-	57 680,9	172,6	3,5	57 684,4	328
1988	57 680,9	181,8	n/a	-	57 449,1	183,7	-1,9	57 497,2	316
1989	57 499,1	177,8	n/a	-	57 321,3	179,9	-2,1	57 319,2	322
1990	57 321,3	174,9	n/a	-	57 146,4	185,4	-10,5	57 135,9	327
1991	57 146,4	178,5	n/a	-	56 967,9	181,9	-3,4	56 964,5	319
1992	56 967,9	177,4	n/a	-	56 790,5	179,2	-1,8	56 788,7	320
1993	56 790,5	183,9	n/a	-	56 606,6	184,0	-0,1	56 606,5	308
1994	56 606,6	196,5	n/a	-	56 410,1	193,7	2,8	56 412,9	287
1995	56 410,1	205,6	n/a	-	56 204,5	205,7	-0,1	56 204,4	273
1996	56 204,5	205,0	n/a	-	55 999,5	206,2	-1,2	55 998,3	273
1997	55 999,5	219,3	n/a	-	55 780,2	217,1	2,2	55 782,4	254
1998	55 780,2	223,9	n/a	-	55 556,3	223,0	0,9	55 557,2	248
1999	55 556,3	223,3	n/a	-	55 333,0	221,7	1,6	55 334,6	248
2000	55 333,0	224,9	n/a	-	55 108,1	223,6	1,3	55 109,4	246
2001	55 108,1	223,5	n/a	-	54 884,6	218,8	4,7	54 889,3	246

n/a: not available
See section 2, methodological notes, for definitions of the variables
Source: Department of Minerals and Energy (SAMI 1999/2000 and Statistical Tables 1980–2001)

Figure 3: Coal: Estimated number of years to depletion for South Africa: 1980–2001



Source: Department of Minerals and Energy (SAMI 1999/2000 and Statistical Tables 1980–2001)
Calculations done by Stats SA

Figure 3 shows that the estimated number of years to depletion for coal, based on declined over the 21-year period from 511 years in 1980 to 246 years in 2001. This is a result of an increase in the production of coal during that period.

4. RESOURCE RENT FOR THE SOUTH AFRICAN MINING INDUSTRY[6]

This section provides the calculations for resource rent for South Africa's gold, platinum and coal.

4.1 Gold

Table 4 (page 17) shows the output, intermediate consumption, compensation of employees, unit rent, resource rent and other calculations for gold for the period 1980 to 2001. Gold output (sales) increased from R10 395 million in 1980 to R29 011 million in 2001, with its minimum level at R8 554 million in 1981. Intermediate consumption moved from its minimum level of R1 554 million in 1980 to reach its maximum of R8 883 million by the year 1996 and further declined to reach R8 878 million in 2001. Unit rent decreased over the same period from R10 249 per kg in 1980 to R5 286 per kg in 2001, reaching a maximum of R10 838 million in 1986 and a minimum level of R318 million in 2000. Total compensation of employees increased in the 21-year period, with a great improvement in the compensation of female employees, which moved from R18 million in 1980 to R229 million in 2001 (see figure 4, page 18).

Intermediate consumption was obtained from the Census of Mining published by Stats SA. The census is done every three years (e.g. 1990, 1993, 1996). Data were extrapolated for the intercensal years. Opportunity cost of capital, rent and unit rent were calculated using a social discount rate (SDR) of both 3% and 5%. Consumption of capital and opportunity cost of capital was calculated using the replacement values shown in Annexure A.

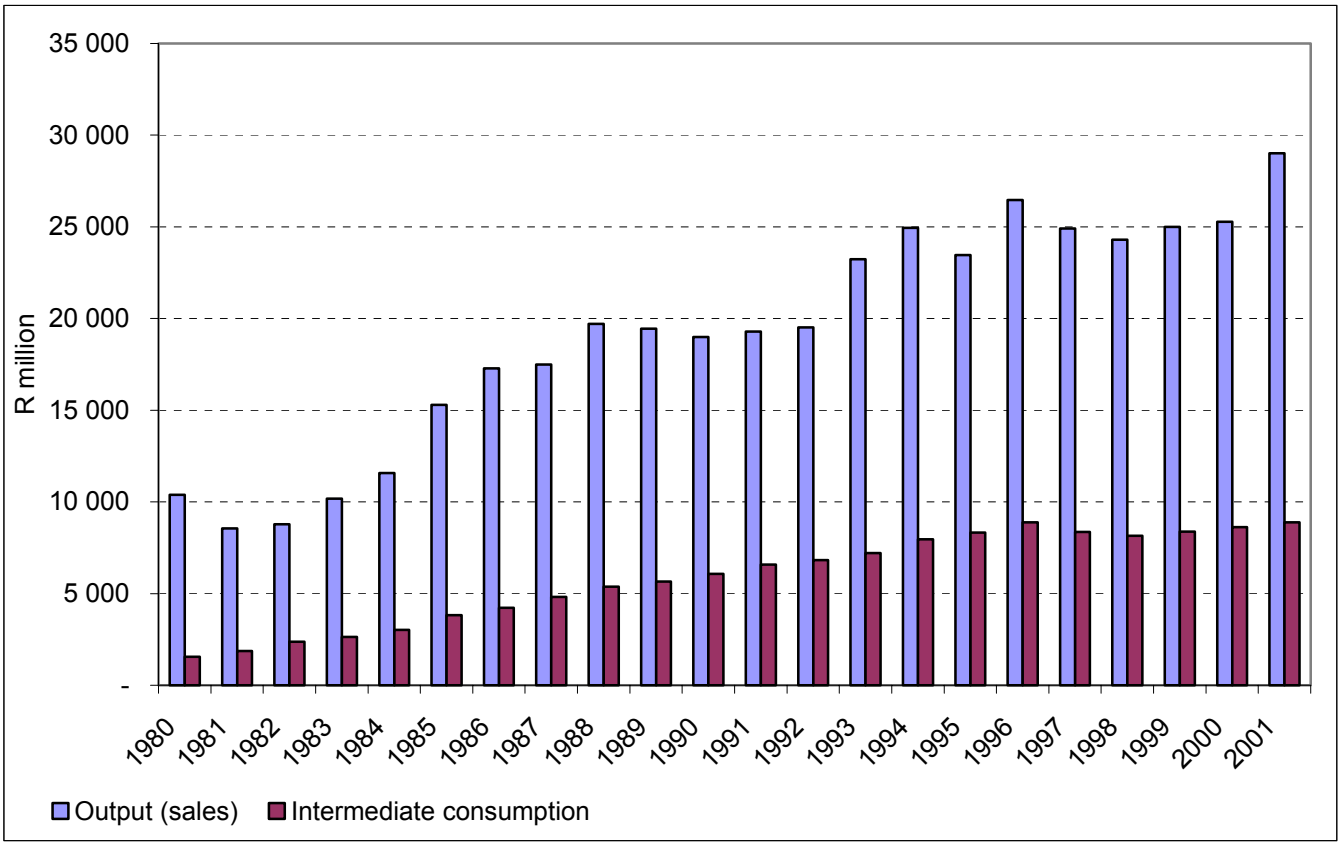
[6] These figures are taken from Statistical tables from DME

Table 4: Gold: Resource rent and other calculations for South Africa at current prices: 1980–2001 (R million)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Output (sales)	10 395	8 554	8 778	10 177	11 574	15 291	17 283	17 495	19 701	19 439	18 994	19 296	19 513	23 239	24 953	23 456	26 468	24 905	24 295	24 990	25 272	29 011
Intermediate consumption	1 554	1 860	2 379	2 639	3 028	3 822	4 219	4 814	5 372	5 651	6 069	6 579	6 834	7 216	7 957	8 327	8 883	8 358	8 154	8 387	8 627	8 878
Compensation of employees (total)	1 448	1 793	2 098	2 438	2 844	3 311	3 949	4 851	5 491	6 081	6 715	6 850	6 940	7 200	7 612	8 287	8 794	9 599	9 205	9 100	9 809	10 904
Compensation of employees (male)	1 430	1 769	2 068	2 402	2 801	3 255	3 880	4 761	5 388	5 964	6 581	6 701	6 795	7 050	7 462	8 102	8 589	9 376	8 999	8 902	9 586	10 674
Compensation of employees (female)	18	24	30	36	43	56	69	90	103	117	134	149	145	150	150	185	205	223	206	198	223	229
Consumption of capital	306	385	478	575	658	817	1 074	1 262	1 527	1 776	2 069	2 331	2 567	2 808	3 090	3 382	3 661	3 948	4 125	4 370	4 734	5 113
Opportunity cost of capital (SDR 3%)	173	223	279	339	394	495	651	752	902	1 053	1 201	1 318	1 411	1 499	1 595	1 693	1 779	1 862	1 875	1 917	2 002	2 087
Opportunity cost of capital (SDR 5%)	289	372	464	565	657	826	1 085	1 254	1 504	1 756	2 002	2 196	2 352	2 498	2 659	2 822	2 964	3 103	3 125	3 195	3 337	3 478
Resource Rent (SDR 3%)	6 913	4 293	3 544	4 186	4 650	6 846	7 390	5 816	6 409	4 878	2 940	2 218	1 761	4 516	4 699	1 766	3 352	1 138	936	1 216	100	2 029
Resource Rent (SDR 5%)	6 798	4 144	3 358	3 961	4 387	6 515	6 957	5 314	5 807	4 176	2 139	1 340	821	3 517	3 636	638	2 166	-103	-314	-102	-1 198	638
Unit rent (R/kg) (SDR 3%)	10 240	6 359	5 250	6 365	6 999	10 071	10 838	8 642	10 013	8 072	4 743	3 650	2 911	7 515	7 666	2 852	5 776	2 172	1 879	2 397	318	5 286
Unit rent (R/kg) (SDR 5%)	10 069	6 301	5 055	5 827	6 434	9 682	10 870	8 793	9 367	6 871	3 536	2 229	1 339	5 679	6 266	1 217	4 346	-211	-675	-227	-2 779	8 810

Source: Department of Minerals and Energy (Statistical Tables 1980-2001), Stats SA Census of Mining
Calculations done by Stats SA

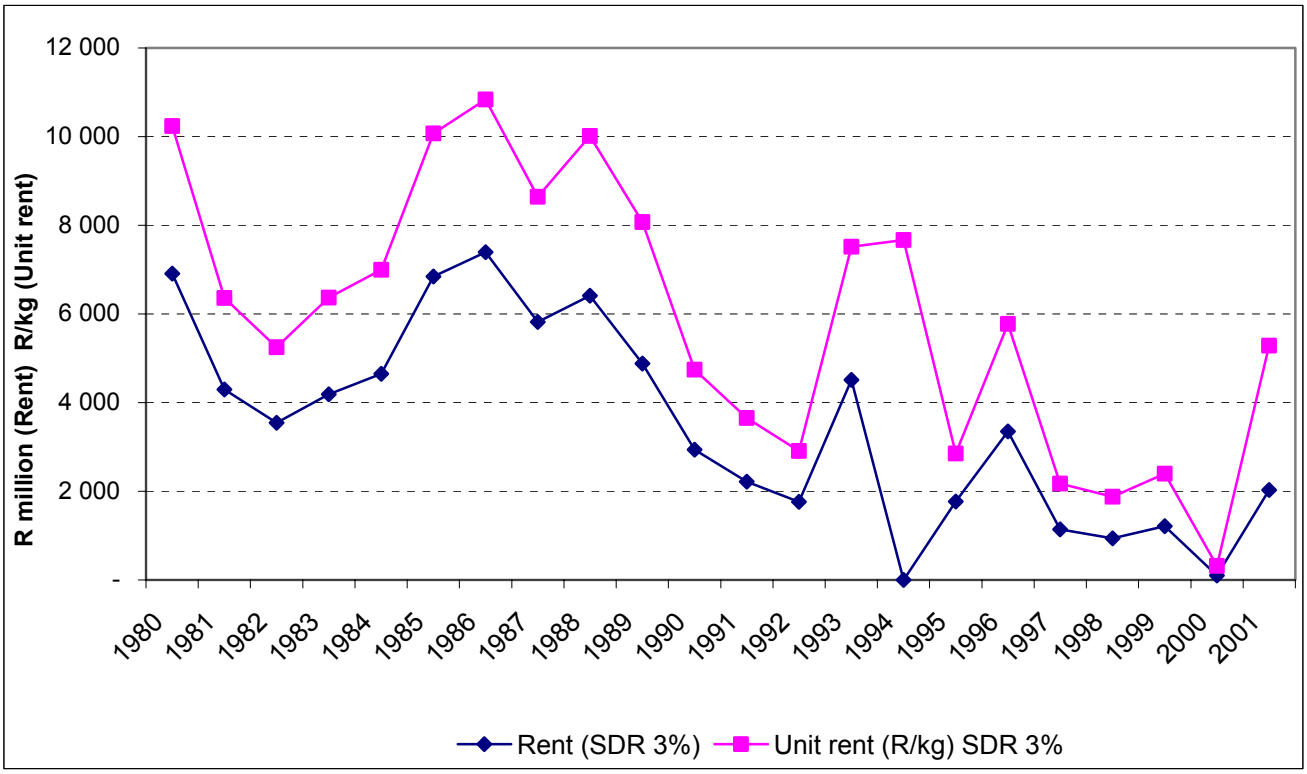
Figure 4: Gold: Output and intermediate consumption: 1980–2001 (R million)



Source: Department of Minerals and Energy (Statistical Tables 1980-2001), Stats SA Census of Mining
Calculations done by Stats SA

Figure 4 shows an increase in the output of the gold mining industry over the period from R10 395 million in 1980 to R29 011 million in 2001. Similarly, intermediate consumption also increased over the period from R1 554 million in 1980 to R8 878 million in 2001.

Figure 5: Gold: Resource and unit rent for South Africa: 1980–2001 (R million and R/kg)



Source: Department of Minerals and Energy (Statistical Tables 1980-2001), Stats SA Census of Mining
Calculations done by Stats SA

Figure 5 shows resource rent as well as unit rent for gold for SDR 3%. From the graph, it is evident that resource and unit rent are moving in the same direction, meaning that when resource rent declines, unit rent also declines. Both curves show a downward movement from R6 914 million and R10 240 million to R3 544 million and R5 250 million respectively in 1980 to 1982 and but from 1982 to 1986 both curves show positive movements. A sharp decline in rent (resource and unit) was also experienced between 1996 and 2000, with a sharp increase towards 2001. By the year 2000, unit rent for gold experienced its lowest level in the 21-year period.

4.2 Platinum

Table 5 (page 21) shows output, intermediate consumption, employment figures, unit rent, resource rent as well as other calculations for platinum for the period 1980 to 2001. Platinum output (sales) increased from R851 million in 1980 to R17 311 million in 2001, and intermediate consumption also increased from R126 million in 1980 to R5 886 in 2001. Unit rent also increased over the same period from R3 997 million in 1980 to R15 432 million in 2001, reaching its lowest level of R1 381 million in 1992. Resource rent increased from R457 million in 1980 to R4 003 million in 2001, reaching its lowest level of R211 million in 1992. Total employment figures had increased over the period, with a major improvement on compensation of female employees from R3 million in 1980 to R109 million in 2001 (see figure 6, page 22).

Intermediate consumption was obtained from various Stats SA Census of Mining publications. The census is done every three years (e.g. 1990, 1993, 1996). Data were extrapolated for the intercensal years. Opportunity cost of capital, rent and unit rent were calculated using a social discount rate of both 3% and 5%. There was a lack of data regarding platinum for intermediate consumption, consumption of capital and opportunity cost of capital. These variables were calculated as percentage of output (derived from ratios of gold).

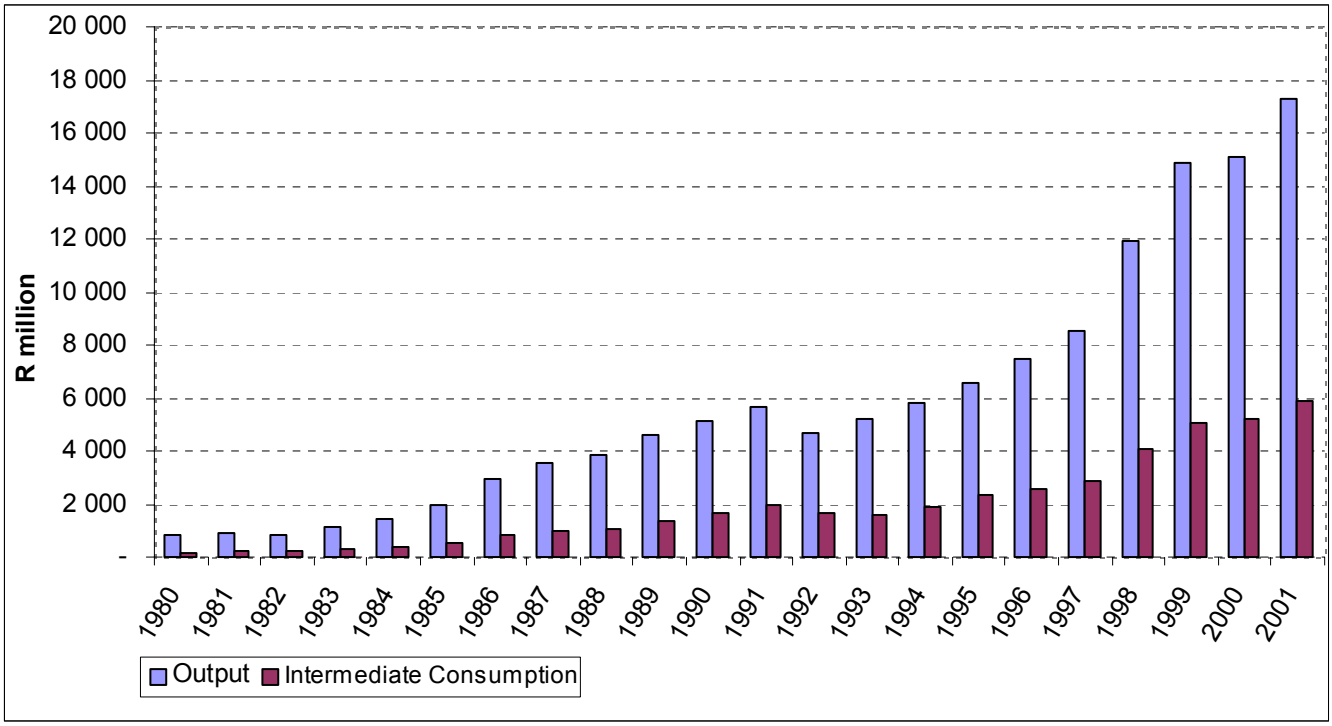
Table 5: Platinum: Resource rent and other calculations for South Africa at current prices: 1980–2001 (R million)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Output (sales)	851	937	852	1 118	1 432	1 998	2 964	3 581	3 813	4 611	5 164	5 692	4 678	5 189	5 810	6 573	7 486	8 510	11 930	14 887	15 095	17 311
Intermediate consumption	128	206	230	291	372	500	830	967	1 030	1 337	1 652	1 935	1 637	1 609	1 859	2 366	2 545	2 893	4 056	5 062	5 212	5 886
Compensation of employees (total)	224	278	235	254	341	450	570	768	933	1 106	1 500	1 645	1 894	2 099	2 241	2 522	2 725	2 992	3 474	3 755	4 373	4 915
Compensation of employees (male)	221	273	231	250	337	444	564	758	921	1 090	1 468	1 619	1 861	2 067	2 199	2 471	2 664	2 931	3 364	3 652	4 278	4 806
Compensation of employees (female)	3	5	4	4	4	6	6	10	12	16	32	26	33	32	42	51	61	61	82	89	96	109
Consumption of capital	26	47	43	67	86	100	178	251	305	415	568	683	608	623	697	920	1 048	1 362	2 028	2 531	5 148	3 295
Opportunity cost of capital (SDR 3%)	17	28	26	34	43	60	119	143	191	231	310	398	327	311	349	460	524	596	954	1 191	2 168	1 212
Opportunity cost of capital (SDR 5%)	26	37	43	67	86	100	178	251	305	415	568	626	561	571	639	789	823	1 021	1 551	1 935	3 522	2 060
Resource Rent (SDR 3%)	457	378	319	473	590	889	1 268	1 452	1 355	1 522	1 134	1 030	211	547	664	304	644	667	1 417	2 349	3 193	4 003
Resource Rent (SDR 5%)	448	369	302	439	547	849	1 208	1 345	1 240	1 388	875	803	-23	288	374	-24	344	242	821	1 604	4 839	1 155
Unit rent (R/kg) (SDR 3%)	3 997	3 261	3 742	5 282	5 512	7 302	10 520	11 345	10 287	11 386	7 989	7 210	1 381	3 107	3 611	1 662	3 413	3 394	7 086	10 848	13 947	15 432
Unit rent (R/kg) (SDR 5%)	3 922	3 180	3 542	4 907	5 111	6 974	10 028	10 506	9 418	10 006	6 169	5 616	-149	1 634	2 031	-132	1 825	1 230	4 104	7 410	7 399	8 898

Source: Department of Minerals and Energy (Statistical Tables 1980-2001), Stats SA Census of Mining

Calculations done by Stats SA

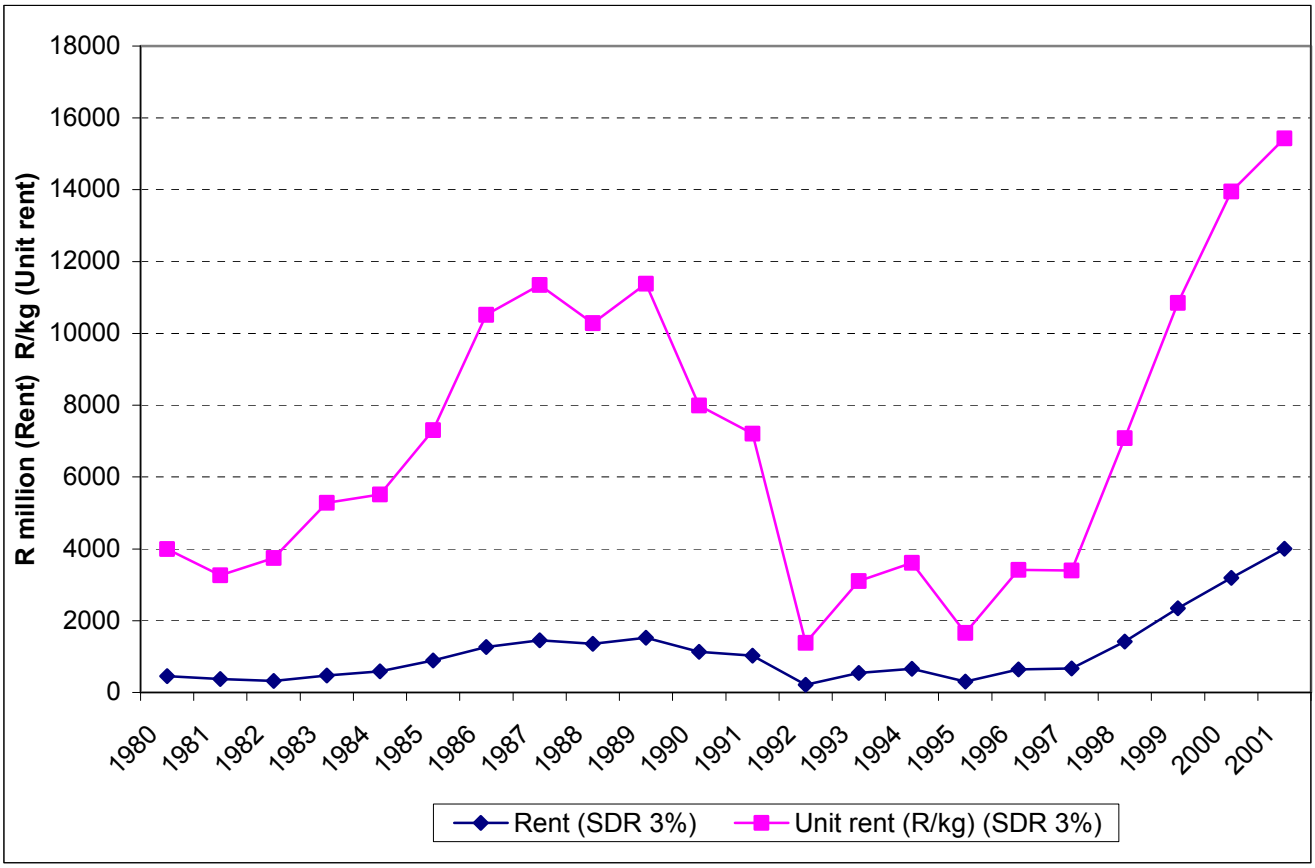
Figure 6: Platinum: Output and intermediate consumption: 1980–2001 (R million)



Source: Department of Minerals and Energy (Statistical Tables 1980-2001), Stats SA Census of Mining
Calculations done by Stats SA

Figure 6 shows an increase in the output of the platinum mining industry over the period from 1980 (R851 million) to 2001 (R17 311 million). Similarly, intermediate consumption also increased over the period from 1980 to 2001. Output and intermediate consumption showed a positive increase, with output increasing faster than intermediate consumption.

Figure 7: Platinum: Resource and unit rent for South Africa: 1980–2001 (R million and R/kg)



Source: Department of Minerals and Energy (Statistical Tables 1980-2001), Stats SA Census of Mining
Calculations done by Stats SA

Figure 7 shows the resource rent and unit rent for platinum for the period 1980 to 2001. The resource rent as well as the unit rent fluctuated a lot between 1980 and 1997 but increased after 1997.

4.3 Coal

Table 6, (page 24) shows the output, intermediate consumption, employment figures, resource rent, unit rent and other calculations for coal for the period 1980 to 2001. Coal output (sales) increased from R1 497 million in 1980 to R25 859 million in 2001 (see figure 8, page 25), and intermediate consumption also increased from R485 million in 1980 to R4 644 million in 2001. Unit rent also increased over the same period from R3 613 million per kg in 1980 to R62 653 million per kg in 2001, reaching its minimum level of R1 201 millions per kg in 1986. Resource rent also increased from R352 million in 1980 to R14 003 million in 2001 (see figure 9, page 26).

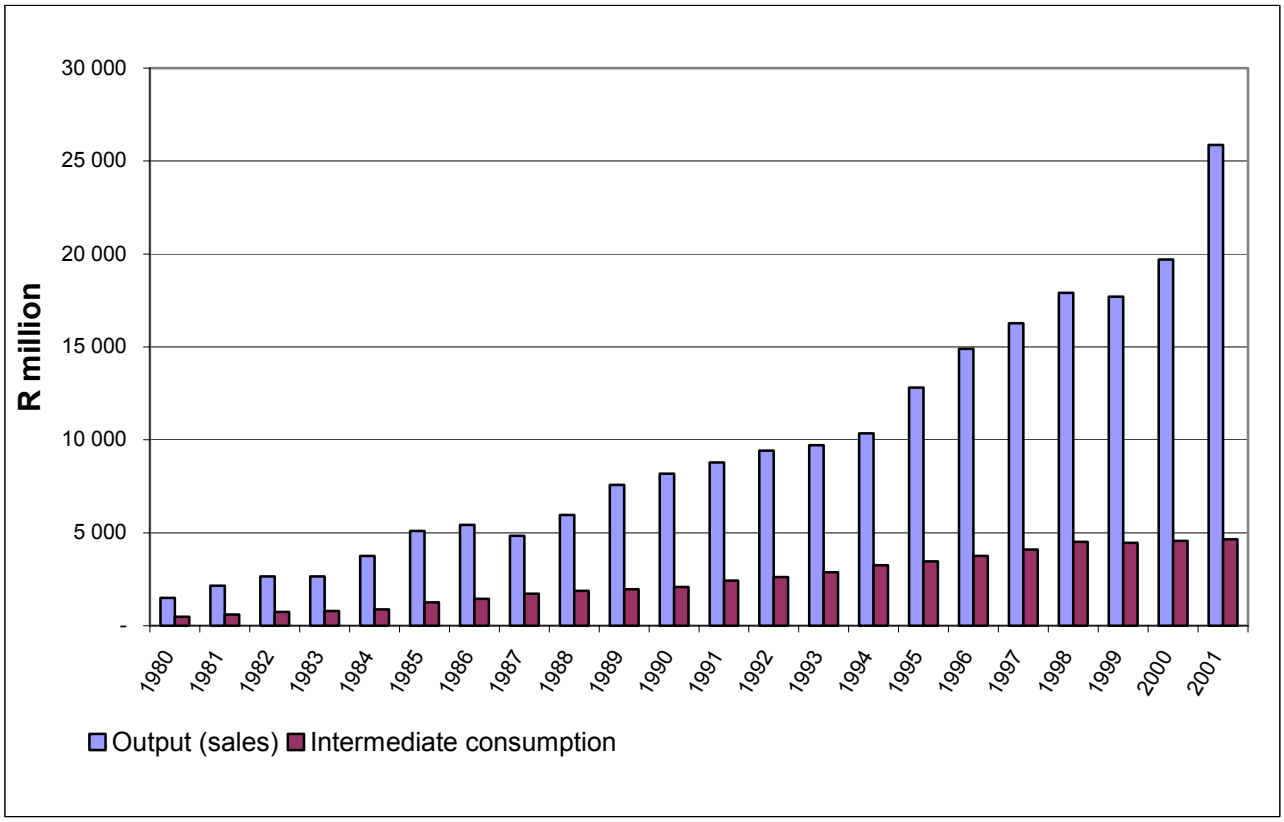
Intermediate consumption was obtained from various Stats SA Census of Mining publications. The census is done every three years (e.g. 1990, 1993, 1996). Data were extrapolated for the intercensal years. Opportunity cost of capital, rent and unit rent were calculated using a social discount rate of both 3% and 5%. Consumption of capital and opportunity cost of capital were calculated using the replacement values shown in Annexure A.

Table 6: Coal: Resource rent and other calculations for South Africa at current prices: 1980–2001 (R million)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Output (sales)	1 497	2 146	2 653	2 651	3 747	5 102	5 433	4 846	5 952	7 569	8 173	8 785	9 424	9 714	10 353	12 818	14 891	16 268	17 917	17 702	19 703	25 859
Intermediate consumption	485	609	732	794	886	1 261	1 449	1 730	1 885	1 963	2 080	2 434	2 611	2 876	3 263	3 457	3 748	4 095	4 510	4 456	4 564	4 644
Compensation of employees (total)	567	738	792	803	903	1 064	1 246	1 383	1 545	1 870	2 125	2 440	2 080	1 878	2 021	2 370	2 765	3 204	3 523	3 814	4 288	4 452
Compensation of employees (male)	554	720	769	777	872	1 028	1 203	1 332	1 487	1 802	2 042	2 343	2 009	1 816	1 949	2 287	2 671	3 095	3 399	3 681	4 127	4 294
Compensation of employees (female)	13	18	23	26	31	36	43	51	58	68	83	97	71	62	72	83	94	109	124	133	161	158
Consumption of capital	55	73	96	121	143	184	243	286	356	430	534	645	728	814	911	1 019	1 145	1 269	1 377	1 508	1 708	1 909
Opportunity cost of capital (SDR 3%)	38	51	68	83	98	124	161	186	228	270	334	401	442	481	526	574	633	686	729	780	783	786
Opportunity cost of capital (SDR 5%)	63	85	113	139	164	207	269	310	380	450	557	668	736	802	876	956	1 056	1 144	1 215	1 301	1 305	1 309
Resource Rent Rent (SDR 3%)	352	675	965	850	1 444	2 468	2 334	1 261	1 938	3 036	3 100	2 865	3 564	3 665	3 632	5 398	6 600	7 014	7 779	7 123	8 299	14 003
Resource Rent (SDR 5%)	327	641	920	794	1 378	2 385	2 227	1 137	1 786	2 856	2 877	2 598	3 269	3 344	3 281	5 015	6 177	6 557	7 293	6 603	7 717	13 480
Unit rent (R/kg) (SDR 3%)	3 613	5 180	6 748	5 838	8 870	14 030	1 201	7 161	1 660	17 075	17 725	16 051	2 0098	19 929	18 484	26 255	32 195	31 984	34 743	31 899	36 901	62 653
Unit rent (R/kg) (SDR 5%)	2 844	4 920	6 434	5 453	8 464	13 559	12 596	6 457	9 824	16 063	16 449	14 555	18 427	18 184	16 697	24 392	30 132	29 900	32 573	29 570	34 313	60 313

Source: Department of Minerals and Energy (Statistical Tables 1980-2001), Stats SA Census of Mining
Calculations done by Stats SA

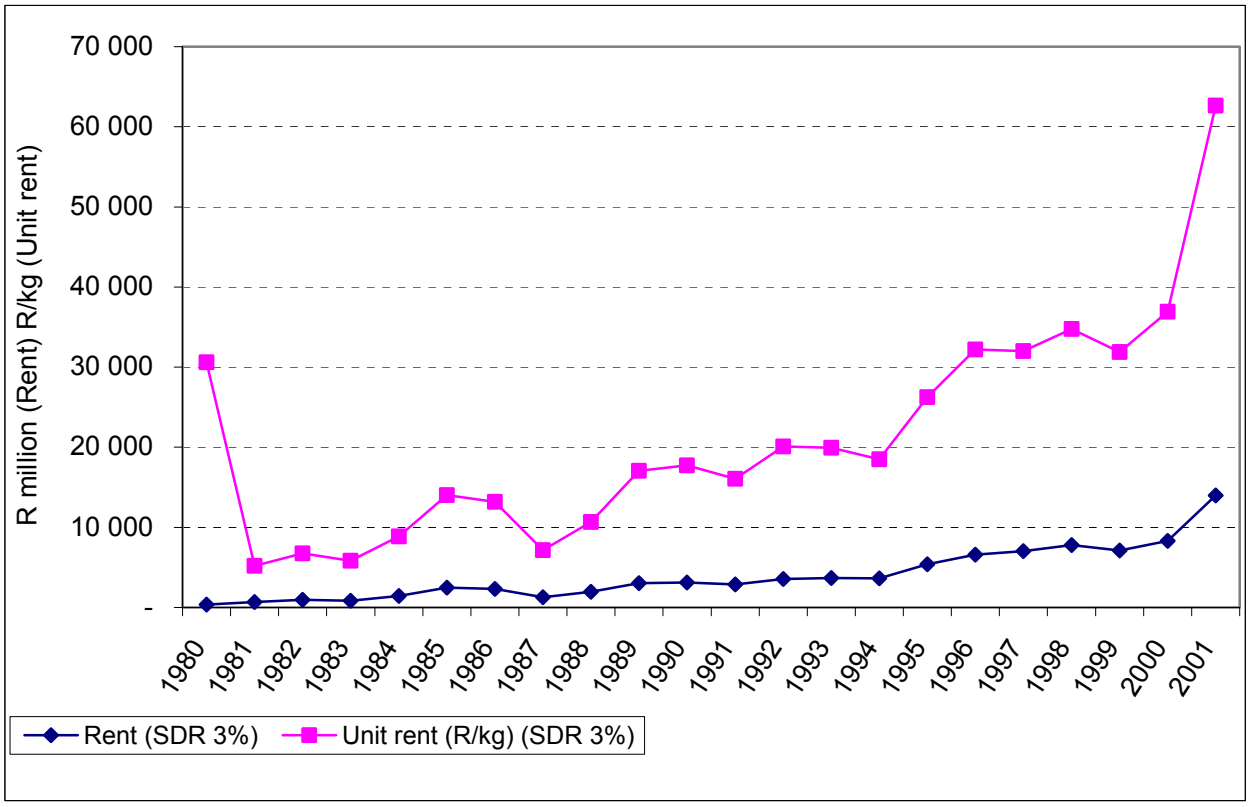
Figure 8: Coal: Output and intermediate consumption: 1980–2001 (R million)



Source: Department of Minerals and Energy (Statistical Tables 1980-2000), Stats SA Census of Mining
Calculations done by Stats SA

Figure 8 shows an increase in the output of the coal mining industry over the period from 1980 (R1 497 million) to 2001 (R25 859 million). Similarly, intermediate consumption also increased over the period from 1980 to 2001, but at a slower rate.

Figure 9: Coal: Resource and unit rent for South Africa: 1980–2001 (R million and R/kg)



Source: Department of Minerals and Energy (Statistical Tables 1980-2001), Stats SA Census of Mining
Calculations done by Stats SA

Figure 9 shows resource and unit rent for coal in South Africa for the period 1980 to 2001 at a social discount rate of 3% (SDR 3%). This figure shows an increase in resource rent as well as unit rent, from 1982 onwards. After 1994, the unit rent increased at a faster rate than the resource rent.

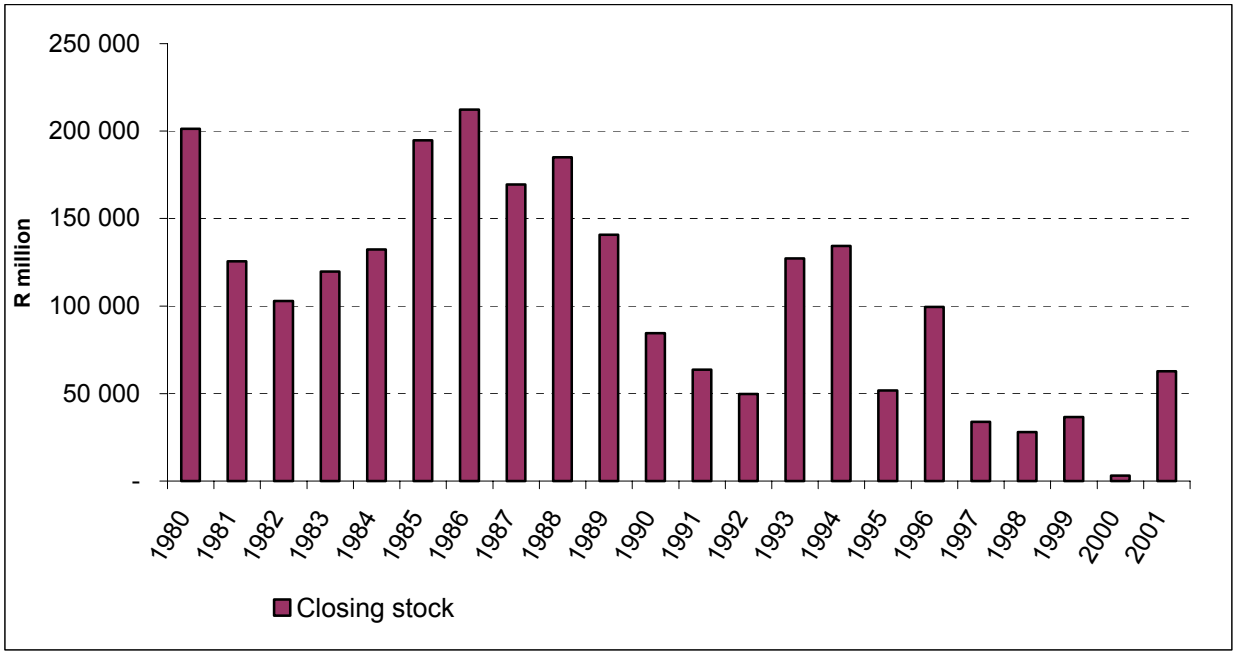
5. MONETARY ACCOUNTS FOR THE SOUTH AFRICAN MINING INDUSTRY

This section describes the monetary accounts for South Africa's gold, platinum and coal.

5.1 Gold

Table 7 (page 28) and figure 10 show the closing stock in the monetary accounts for gold for South Africa for the period 1980 to 2001. The value of the country's gold reserves (stock) steadily depreciated over the period from R201 330 million in 1980 to R62 762 million in 2001, reaching its lowest level of R3 038 million in 2000 and its maximum level of R212 337 million in 1986.

Figure 10: Gold: The value of closing stock for South Africa at current prices: 1980–2001 (R million)



Source: Department of Minerals and Energy (Statistical Tables 1980-2001), Stats SA Census of Mining
Calculations done by Stats SA

Table 7: Gold: Monetary account for South Africa at current prices: 1980–2001 (R million)

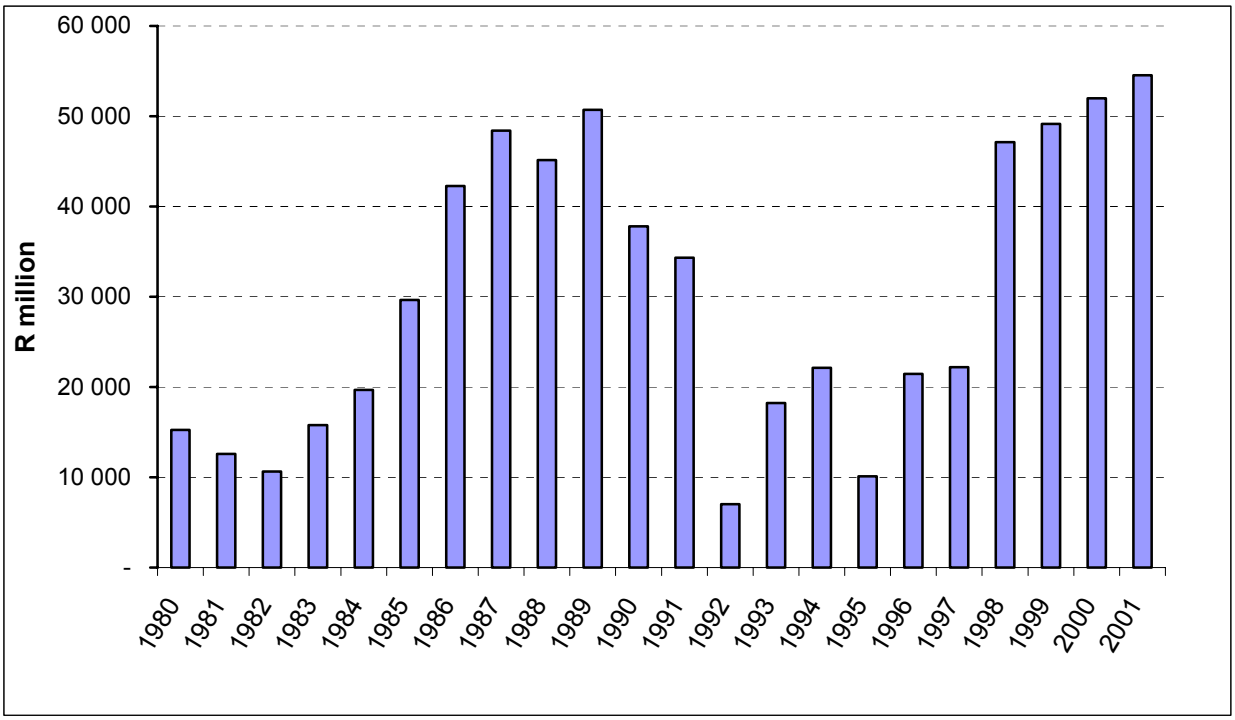
Year	Opening stock	Depletion	Revaluation	Closing stock
1980		0		201 330
1981	201 330	14 947	-90 724	125 553
1982	125 554	12 979	-35 767	102 766
1983	102 766	16 519	414	119 699
1984	119 699	18 807	-6 200	132 306
1985	132 306	27 689	34 794	194 789
1986	194 788	28 451	-10 902	212 337
1987	212 337	20 769	-63 725	169 382
1988	169 382	24 067	-8 440	185 009
1989	185 009	18 318	-62 513	140 814
1990	140 814	11 319	-67 657	84 475
1991	84 475	8 539	-29 284	63 730
1992	63 730	7 298	-21 180	49 848
1993	49 848	19 175	58 128	127 151
1994	127 151	18 544	-11 327	134 368
1995	134 368	5 994	-88 503	51 859
1996	51 859	10 531	37 171	99 561
1997	99 561	3 575	-69 335	33 801
1998	33 801	2 719	-8 430	28 090
1999	28 090	3 441	5 080	36 611
2000	36 611	261	-33 833	3 038
2001	3 038	4 389	55 335	62 762

Source: Department of Minerals and Energy (Statistical Tables 1980-2001), Stats SA Census of Mining
Calculations done by Stats SA

5.2 Platinum

Table 8 (page 30) and Figure 11 show the closing stock in the monetary accounts for platinum in South Africa for the period 1980 to 2001. The value of the country's platinum reserves steadily appreciated over the period from R15 233 million in 1980 to R54 766 million in 2001, reaching its minimum level of R7 008 million in 1991, and a maximum level of R54 766 million in 2001.

Figure 11: Platinum: The value of closing stock in South Africa at current prices: 1980–2001 (R million)



Source: Department of Minerals and Energy (Statistical Tables 1980-2001), Stats SA Census of Mining
Calculations done by Stats SA

Table 8: Platinum: Monetary account for South Africa at current prices: 1980–2001 (R million)

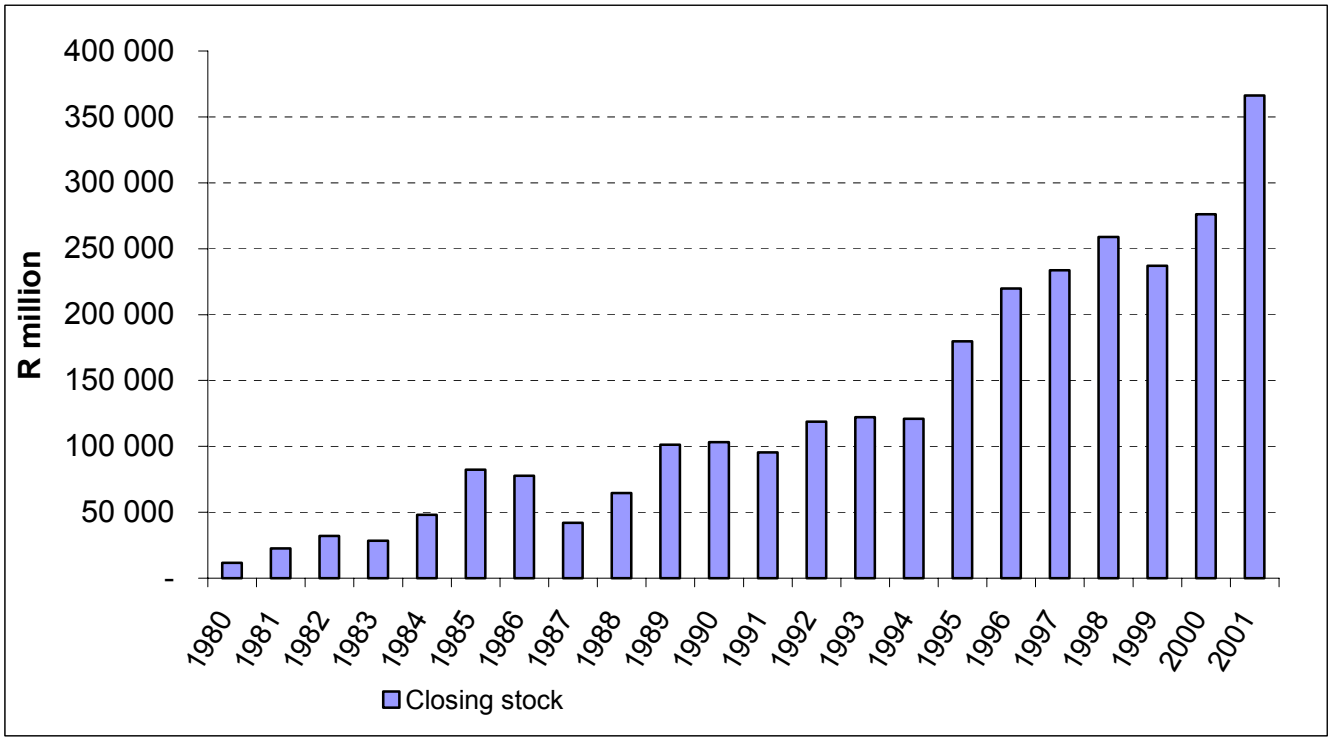
Year	Opening stock	Depletion	Revaluation	Closing stock
1980		0		15 233
1981	15 233	0	-2 633	12 600
1982	12 600	0	-1 967	10 634
1983	10 634	0	5 133	15 767
1984	15 767	0	3 899	19 665
1985	19 665	2	9 963	29 628
1986	29 628	3	12 628	42 257
1987	42 257	3	6 127	48 387
1988	48 387	4	-3 241	45 150
1989	45 150	4	5 559	50 713
1990	50 713	2	-12 938	37 777
1991	37 777	3	-3 472	34 308
1992	34 308	1	-27 301	7 008
1993	7 008	2	11 196	18 206
1994	18 206	4	3 891	22 101
1995	22 101	3	-12 006	10 098
1996	10 098	7	11 320	21 425
1997	21 425	12	743	22 180
1998	22 180	30	24 940	47 150
1999	47 150	50	1 970	49 170
2000	49 170	139	2 866	52 175
2001	52 175	45	2 546	54 766

Source: Department of Minerals and Energy (Statistical Tables 1980-2001), Stats SA Census of Mining
Calculations done by Stats SA

5.3 Coal

Table 9 and Figure 12 (pages 32 and 31) show opening stock, depletion, revaluation and closing stock in the monetary accounts for coal in South Africa for the period 1980 to 2001. The value of South Africa's coal reserves steadily appreciated over the period from R11 733 million in 1980 to R366 442 million in 2001.

Figure 12: Coal: The value of closing stock for South Africa at current prices: 1980–2001 (R million)



Source: Department of Minerals and Energy (Statistical Tables 1980-2001), Stats SA Census of Mining
Calculations done by Stats SA

Figure 12 is a graphical representation of the closing stock for coal for the 21-year period. The closing stock of coal increased from R11 733 million in 1980 to R366 442 million in 2001.

Table 9: Coal: Monetary accounts for South Africa at current prices: 1980–2001 (R million)

Year	Opening stock	Depletion	Revaluation	Closing stock
1980		0		11 733
1981	11 733	0	10 767	22 500
1982	22 500	0	9 666	32 166
1983	32 166	0	-3 834	28 333
1984	28 333	1	19 798	48 131
1985	48 132	5	34 125	82 262
1986	82 262	5	-4 472	77 795
1987	77 795	3	-35 767	42 031
1988	42 031	6	22 558	64 595
1989	64 595	7	36 591	101193
1990	101193	6	2 128	103 327
1991	103 327	7	-7 842	95 492
1992	95 492	9	23 289	118 790
1993	118 790	13	3 349	122 152
1994	122 152	24	-1 136	121 040
1995	121 040	55	58 781	179 876
1996	179 876	67	39 987	219 930
1997	219 930	124	13 616	233 670
1998	233 670	165	25 294	259 129
1999	259 129	151	-22 003	237 277
2000	237 277	187	38 977	276 441
2001	276 441	315	89 686	366 442

Source: Department of Minerals and Energy (Statistical Tables 1980-2001), Stats SA Census of Mining
Calculations done by Stats SA

GLOSSARY

Account
An account is a tool which records, for a given aspect of economic life, (a) the uses and resources or (b) the changes in assets and the changes in liabilities and/or (c) the stock of assets and liabilities existing at a certain time; the transactions accounts include a balancing item which is used to equate the two sides of the accounts (e.g. resources and uses) and which is a meaningful measure of economic performance in itself.

Compensation of employees
Compensation of employees is defined as the total remuneration, in cash or in kind, payable by an enterprise to an employee in return for work done by the latter during the accounting period. Compensation of employees does not include any taxes payable by the employer on the wage and salary bill. Note that in this report compensation of employees will not be equal with other figures published by Stats SA, because such figures are adjusted to benchmarking levels done in 1999, whereas figures in this report are not adjusted.

Consumption of capital
Consumption of fixed capital is a cost of production. It may be defined in general terms as the decline, during the course of the accounting period, in the current value of the stock of fixed assets owned and used by a producer as a result of physical deterioration, normal obsolescence or normal accidental damage. It excludes the value of fixed assets destroyed by acts of war or exceptional events such as major natural disasters, which occur very infrequently.

Fixed assets
Fixed assets may have been purchased in the past at times when both relative prices and the general price level were very different from prices in the current period. In order to be consistent with the other entries, consumption of fixed capital must be valued with reference to the same overall set of current prices as that used to value output and intermediate consumption.

Depletion
The depletion of natural deposits covers the reduction in the value of deposits of subsoil assets as a result of the physical removal and using up of the asset. The changes recorded here are the negative counterparts of gross additions to the level of exploitable subsoil resources that result from reassessments of exploitability, because of changes in technology or relative prices.

Fixed assets or inventories
Subsoil assets are different from the stocks of fixed assets and inventories, the major difference being that the process of production has created them. Although they are neither fixed assets nor inventories, they present characteristics of both. The 1993 SNA assumes that all receipts generated from the use of natural assets can be recorded as income, specifically as part operating surplus. The implicit assumption is that assets are not exhaustible and therefore no deductions from the receipts are necessary.

Intermediate consumption
Intermediate consumption consists of the value of the goods and services consumed as inputs by a process of production, excluding fixed assets whose consumption is recorded as consumption of fixed capital. The goods or services may be either transformed or used up by the production process. Some inputs re-emerge after having been transformed and incorporated into the outputs. Other inputs are completely consumed or used up. Intermediate consumption includes the rentals paid on the use of fixed assets.

Mineral exploration
Mineral exploration consists of the value of expenditures on exploration for petroleum and natural gas and for non-petroleum deposits; it includes pre-license costs, license and acquisition costs, appraisal costs and the costs of actual test drilling and boring, as well as the costs of aerial and other surveys, transportation costs, etc, incurred to make it possible to carry out the tests.

Natural resource accounting
Natural Resource Accounting is an accounting system that deals with stocks and stock changes of natural assets, comprising biota (produced or wild), subsoil assets (proved reserves), water and land with their aquatic and terrestrial ecosystems. It is frequently used in the sense of physical accounting as distinguished from monetary (environmental) accounting.

Natural resources
Natural assets (raw materials) occurring in nature that can be used for economic production or consumption

Non-renewable natural resources
Exhaustible natural resources such as mineral resources that cannot be regenerated after exploitation.

Nominal holding gains
Nominal holding gains depend upon changes in the prices or, more generally, the monetary values, of assets and liabilities over time. Nominal holding gains may accrue on assets held for any length of time during the accounting period and not merely on assets that appear in the opening or closing balance sheets. Nominal holding gains are calculated with reference to assets or liabilities that remain qualitatively and quantitatively unchanged during the period over which the holding gain is measured.

Opportunity cost
In the System, the cost of using, or using up, some existing asset or good in one particular process of production is measured by the amount of benefits that could have been secured by using the asset or good in alternative ways. Opportunity cost is calculated with reference to the opportunities foregone at the time the asset or resource is used, as distinct from the costs incurred at some time in the past to acquire the asset.

Proved reserves
Such estimated quantities of mineral deposits, at a specific date, as analysis of geological engineering data demonstrates with reasonable certainty to be recoverable in the future under the same economic and operational conditions.

Physical accounting
Natural resource and environmental accounting of stocks and changes in stocks in physical (non-monetary) units, for example, weight, area or number. Qualitative measures, expressed in terms of quality classes, types of uses or ecosystem characteristics, may supplement quantitative measures. The combined changes in asset quality and quantity are called volume changes.

Rent/royalties
The owners of assets, whether private or government units, may grant leases to other institutional units permitting them to extract such deposits over a specified period of time in return for the payment of rents. These payments are often described as royalties, but they are essentially rents that accrue to owners of the assets in return for putting them at the disposal of other institutional units for specified periods of time and are treated as such in the System. The rents may take the form of

periodic payments of fixed amounts, irrespective of the rate of extraction or, more likely, they may be a function of the quantity or volume of the asset extracted.

Revaluation
Revaluation is the positive or negative holding gain accrued during the accounting period to the owners of financial or non-financial assets and liabilities.

Satellite accounts
Satellite accounts provide a framework linked to the central accounts and which enables attention to be focused on a certain field or aspect of economic and social life in the context of national accounts: common examples are satellite accounts for the environment, tourism or unpaid household work.

Stocks
Stocks are a position in, or holdings of, assets and liabilities at a point in time and the SNA records stocks in accounts, usually referred to as balance sheets, and tables at the beginning and end of the accounting period. Stocks result from the accumulation of prior transactions and other flows, and they are changed by transactions and other flows in the period (note that stocks of goods are referred to as "inventories" in the SNA).

Subsoil assets
Subsoil assets are defined in the 1993 SNA as proven resources of mineral deposits located on or below the earth's surface that are economically exploitable, given current technology and relative prices. Subsoil assets consist of coal, oil and natural gas reserves, metallic mineral reserves and non-metallic mineral reserves. The SEEA (System of Integrated Environmental and Economic Accounting) adopts the same definition as the SNA.

Subsoil assets are classified according to:

- *The degree of geological certainty*
- *The degree of economic feasibility of the reserves.*

The boundary between discovered and undiscovered fluctuates as a result of exploration and development, differing geological conditions and technological improvements. The degree of economic feasibility on the other hand categorizes the resource under economic, marginally economic and sub-economic according to the relationship between prices and extraction costs and technological exploitability.

System of integrated Environmental and Economic Accounting (SEEA)
Satellite system of the System of National Accounts (SNA) proposed by the United Nations (1993a) for the incorporation of environment concerns (environmental costs, benefits and assets) into national accounts.

System of national accounts
The revised (1993) system adopted worldwide for conventional economic (national) accounting (Commission of the European Communities and others, 1993).

Taxes
Taxes are compulsory, unrequited payments, in cash or in kind, made by institutional units to government units. They are transfers because the government provides nothing in return to the individual unit making the payment, although government may use the funds raised in taxes to provide goods and services to other units, either individually or collectively, or to the community as a whole.

ANNEXURE A

Consumption of capital for total mining, coal, gold and other mining at replacement value and the fixed capital stock of total mining, coal, gold and other mining in South Africa at current prices: 1980–2001 (R million)

Year	Consumption of capital at replacement value (R million)				Fixed capital stock at current prices (R million)			
	Total mining	Coal	Gold	Other mining	Total mining	Coal	Gold	Other mining
1980	786	54,60	306	425	11 789	1 268	5 781	4 741
1981	976	72,63	385	518	14 638	1 694	7 436	5 507
1982	1 206	96,49	478	632	18 095	2 254	9 284	6 557
1983	1 433	120,55	575	738	21 499	2 782	11 296	7 420
1984	1 639	143,32	658	838	24 585	3 271	13 134	8 180
1985	2 021	184,22	817	1 019	30 310	4 148	16 514	9 648
1986	2 423	243,31	1 074	1 105	36 343	5 372	21 696	9 275
1987	2 803	285,87	1 262	1 255	42 041	6 190	25 083	10 768
1988	3 374	355,78	1 527	1 492	50 617	7 593	30 083	12 941
1989	4 068	430,04	1 776	1 862	61 013	8 995	35112	16 909
1990	4 708	534,42	2 069	2 105	70 621	11 136	40 033	19 452
1991	5 285	644,54	2 331	2 309	79 276	13 353	43 922	22 001
1992	5 708	728,44	2 567	2 413	85 626	14 727	47 031	23 867
1993	6 025	814,16	2 808	2 403	90 375	16 034	49 957	24 385
1994	6 418	911,48	3 090	2 417	96 275	17 527	53 173	25 576
1995	6 861	1 019,09	3 382	2 459	102 910	19 124	56 441	27 345
1996	7 271	1 144,59	3 661	2 465	109 061	21 111	59 288	28 662
1997	7 764	1 269,03	3 948	2 547	116 463	22 873	62 062	31 528
1998	8 177	1 376,84	4 125	2 675	122 625	24 292	62 508	35 852
1999	8 626	1 507,76	4 370	2 748	129 389	26 010	63 909	39 469
2000	9 230	1 708,19	4 734	2 788	138 457	29 097	66 736	42 624
2001	9 830	1 908,62	5 113	2 828	148 149	33 292	69 563	45 779

Source: Basic data, SARB
Calculations done by Stats SA

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