

# **NATURAL RESOURCE ACCOUNTING: MINERAL ACCOUNTS FOR SOUTH AFRICA 1980 – 2000**

**Discussion Document**

**July 2002**

**Statistics South Africa**

## **Background information on natural resource accounting in Statistics South Africa**

Statistics South Africa (Stats SA) implemented the 1993 System of National Accounts (SNA) in June 1999 in conjunction with rebasing and benchmarking of Gross Domestic Product (GDP) estimates. In addition, Stats SA also published the first set of supply and use tables (SU-tables). These tables were developed to include all the transactions in goods and services in the South African economy for a specific year in matrix format. The first set of these tables with 1993 as reference year were published in 1999. Subsequent tables were published for 1998 and 1999. As a next step towards implementing the 1993 SNA, Stats SA has now compiled Natural Resource Accounts (NRA) (satellite accounts) for minerals and water. Satellite accounts or systems (e.g. NRA) 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.

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.

Natural resource accounting (NRA) deals with stocks and stock changes of natural assets, which comprise biological assets (produced or wild), subsoil assets (proved reserves), water, air and land areas (including water areas) with their terrestrial and aquatic ecosystems (ecozones). In natural resource accounting, measurement in both physical and monetary units are necessary to obtain a more comprehensive picture of the changes in natural assets. The compilation of all natural resource accounts (NRA) follows two basic steps, namely the development of physical accounts and the development of monetary accounts. The latter can only be compiled after resource values have been established.

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. Department of Minerals and Energy.

The mining and quarrying industry has always been an important industry in the South African economy, especially during the early stages of economic growth. In South Africa the mining and quarrying industry's contribution to GDP declined from 20,4 percent in 1980, to 6,5 percent in 2000. Similarly, the mining and quarrying industry's contribution to non-agricultural business employment declined from 33,8 percent in 1980 to 26,3 percent in 2000.

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## 1. Introduction

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

The central framework of the SNA presents a number of characteristics, which give 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. The counterpart of these benefits is that there are certain limitations as to what may be accommodated directly in the central framework. Among the major shortcomings of the SNA is its focus on the production and the 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 renders conventional measures of national income and wealth inappropriate for evaluating long-term welfare aspects and sustainability.

Satellite accounts or systems (e.g. NRA) 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 with 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 to a given field or topic, they are also linked to the information system specific to this field or topic. They also call for better integration of monetary and physical data. 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, as tool for analyses and for statistical coordination.

Typically satellite accounts or systems allow for -

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

Statistics South Africa (Stats SA) has implemented the 1993 SNA in June 1999 in conjunction with rebasing and benchmarking of Gross Domestic Product (GDP) estimates. In addition, Stats SA also published the first set of supply and use tables (SU-tables), which intended to include all the transactions in goods and services in the South African economy for a specific year in matrix format, for the 1993 reference year in 1999. Subsequent tables were published for 1998 and 1999. As a next step towards implementing the 1993 SNA, Stats SA has now compiled NRA (satellite accounts) for minerals and water.

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 discussion document gives a background on the exposition of NRA together with an explanation of the methodology (techniques and method used) for the compilation of the mineral accounts. A brief overview of minerals in the South African economy follows. Thereafter the data for the physical and monetary accounts are given for the period 1980 to 2000. 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. Department of Minerals and Energy in the compilation of NRA.

## **2. An exposition of natural resource accounting**

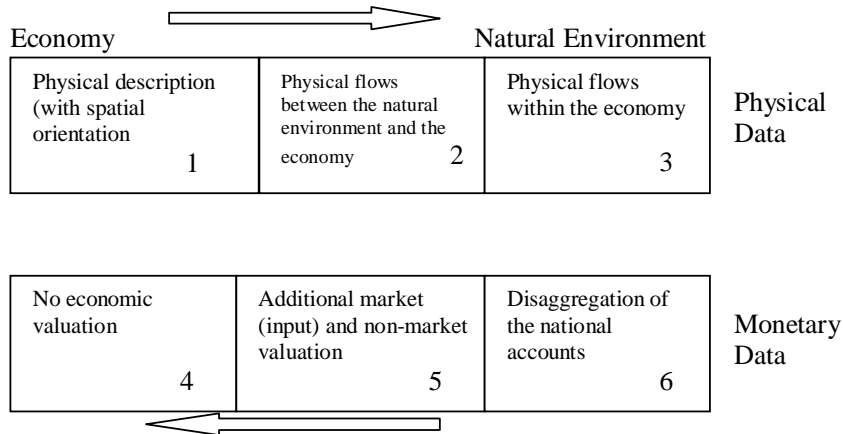
Natural resource accounting deals with stocks and stock changes of natural assets, which comprise biological assets (produced or wild), subsoil assets (proved reserves), water, air and land areas (including water areas) with their terrestrial and aquatic ecosystems (ecozones). In natural resource accounting, measurement in both physical and monetary units are necessary to obtain a more comprehensive picture of the changes in natural assets. Physical data are usually measured in units of weight. Other possible units are number (for example, of species) and area (land). Qualitative measures can supplement quantitative measures, for example, in recording inventories of natural resources.

For physical accounts, natural resource accounting describes in particular that part of the natural environment that is economically used (and affected) by economic activities, and shows the changes in natural assets in so far as those changes are important from an economic point of view. Use of the information contained in NRA for the (satellite) system for integrated environmental and economic accounting (SEEA) is limited to recording physical flows from natural assets to the economy (use of natural assets) and flows back to the natural environment (residual flows).

It is useful to describe the flows of natural resource inputs, products and residuals in a breakdown by type of input and output if existing classifications of production and consumption activities are detailed enough. In most instances, these classifications are not detailed enough, and in many countries, including South Africa, a breakdown of activities by industry according to the International Standard Industrial Classification of all economic activities (ISIC) seems to present disaggregation at the only attainable level.



The following diagram describes 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

The integrated physical and monetary accounts of the SEEA comprise 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 the use of products in terms of physical units (normally units of weight such as ton). 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 can be done according to three different approaches i.e.:

1. Using environmental expenditure. This is the most common approach in most industrialized economies, reflecting the prime concern about pollution and environmental quality in these countries. This approach work 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; and
3. Full environmental accounting. This represents examples of attempts to accommodate all entries of the more comprehensive physical resource account in the 1993 SNA with money values assigned.

### 3. Methodology for the compilation of natural resource accounts for minerals

The compilation of all natural resource accounts (NRA) follows two basic steps, namely the development of physical accounts and the development of monetary accounts. The latter can only be compiled after resource values have been established.

#### 3.1 Physical accounts

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

1. Volume sold (in ton),
2. Change in inventories (in ton) (calculated as the difference between the production volume (extraction) and the volume sold),
3. Closing stock (in ton) 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 i.e.:

1. Total stock of the mineral that is equal to the reserve.
2. Economically proven reserves defined as that proportion of the mineral resource that is economically feasible to extract.
3. Subtract from the second (economically proven reserves) any possible wastes that may occur during the extraction process.

The second measure was used for the South African mineral accounts, as we only account for economically proven reserves.

This discussion document has made the best possible efforts to calculate economically proven reserves using published (and for coal unpublished) data from the Minerals Bureau of South Africa (Department of Minerals and Energy).

Resources are divided into identified resources and undiscovered resources (Tietenberg 2000):

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

1. **Measured resources:** material for which quantity and quality estimates are within a margin of error of less than 20 percent, from geologically known sample sites.
2. **Indicated resources:** material for which quantity and quality are estimated partly from sample analyses and partly from reasonable geological projections, and
3. **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:

1. **Hypothetical resources:** undiscovered materials reasonably expected to exist in a known mining district under known geological conditions.
2. **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 recognized.

It is important to note that the mineral accounts only account for the resources mentioned under 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; or
3. stock at the end of the year / extraction of the year.

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

### 3.2 Monetary accounts

The value of the 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)
<i>less</i>	Value of the depleted stock (valued at the unit rent multiplied by the volume of depletion)
<i>plus</i>	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)
<i>plus</i>	Any revaluation due to time passing (valued by discounting for one year less)
<i>plus</i>	Nominal holding gain (calculated as a residual)
<i>equal</i>	Closing stock or the value of the resource asset at the end of the period

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 the monetary accounts therefore presupposes the calculation of the resource rent and the unit rent ( $R_t$ ) 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.

For the South African mineral accounts (monetary) there are two monetary accounts for coal as opposed to one each for platinum and gold.

## Resource Rent

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

the value of output (at producer prices)  
less production costs.

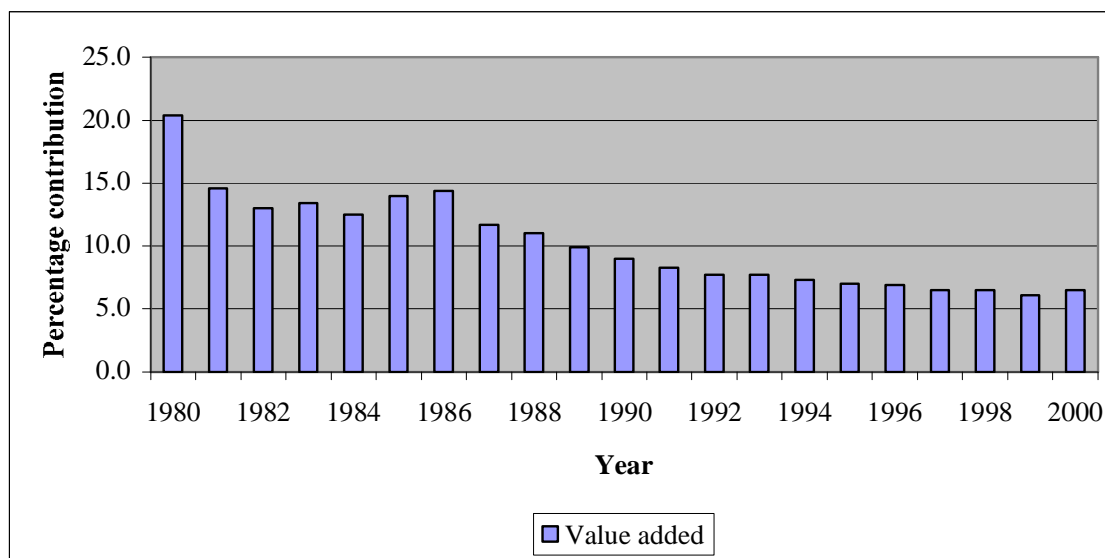
Production costs include the cost of intermediate inputs in mining, plus compensation of employees and consumption of fixed capital plus a normal rate of return on investment capital. The normal rate of return on fixed capital investments is the opportunity cost or economic value of financial capital that may be invested in alternative profit-making economic activities. The average long-term nominal interest rate less 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 percent for the period 1973 to 1982 and 3,3 percent for the period 1983 to 1998. A social discount rate ( $r$ ) of 3,0 percent was used to calculate the resource rent. An alternative discount rate of 5,0 percent, and both calculations are shown in the resource rent tables (cf. table . Average rather than marginal costs were used in calculating resource rents. The unit rent ( $R_t$ ) was calculated as total rent divided by the volume of depletion for a specific year. Due to a lack of data regarding platinum for intermediate consumption, consumption of capital and opportunity cost of capital for the platinum mining sector, these variables were calculated as 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 (1910-2000) is shown in Annexure A (p. 67) and Annexure B (p. 69).

#### 4. Mining in the South African economy

The mining and quarrying industry has always been an important industry in the South African economy, especially during the early stages of economic growth. The contribution of the mining and quarrying industry to Gross Domestic Product (GDP) (cf. table 1, p.14) and employment (cf. table 2, p.15) had however declined. This followed the general trend observed world wide with the decline of primary industry activities' contribution to GDP and employment. In South Africa the mining and quarrying industry's contribution to GDP declined from 20,4 percent in 1980, to 6,5 percent in 2000 (cf. table 1, p.14 and figure 1, p.13).

**Figure 1 - Percentage contribution of the mining and quarrying industry to gross value added at basic prices in South Africa at current prices: 1980-2000**



Source: Stats SA (South African Statistics 2001)

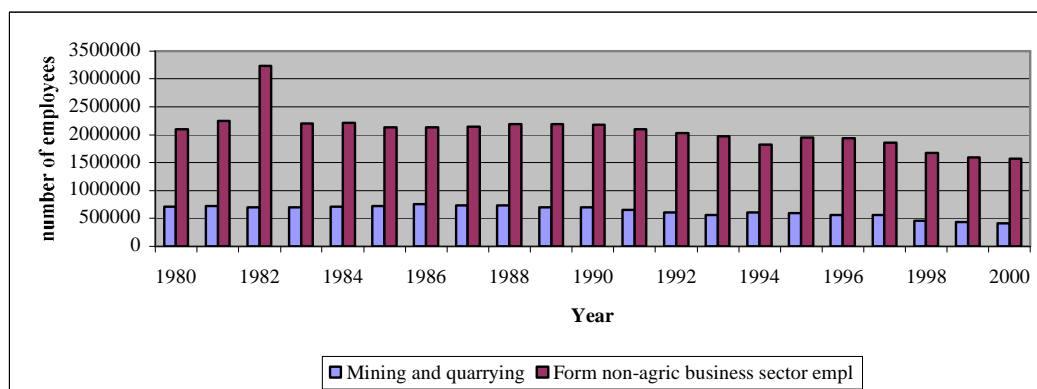
**Table 1 - Contribution of the mining and quarrying industry to gross value added at basic prices in South Africa at current and constant prices: 1980-2000 (R million)**

Year	Value added at current prices (R million)			Value added at constant 1995 prices (R million)		
	Mining and quarrying	Gross value added at basic prices	Percentage contribution	Mining and quarrying	Gross value added at basic prices	Percentage contribution
1980	12 146	59 658	20,4	36 731	419 499	8,8
1981	10 064	68 848	14,6	36 525	440 514	8,3
1982	10 035	77 083	13,0	36 570	437 509	8,4
1983	11 951	88 895	13,4	36 676	427 971	8,6
1984	12 985	103 706	12,5	38 098	450 379	8,5
1985	16 717	119 585	14,0	38 228	448 739	8,5
1986	20 127	139 909	14,4	36 924	448 782	8,2
1987	19 127	163 786	11,7	35 213	445 810	7,9
1988	21 441	194 192	11,0	35 827	473 121	7,6
1989	22 891	231 012	9,9	35 451	474 728	7,3
1990	24 107	266 783	9,0	35 171	481 077	7,3
1991	25 542	307 089	8,3	34 397	475 697	7,2
1992	26 575	344 003	7,7	34 978	465 159	7,5
1993	30 052	390 842	7,7	35 782	471 670	7,6
1994	32 111	440 147	7,3	38 946	485 783	7,4
1995	34 830	500 354	7,0	34 830	500 354	7,0
1996	38 786	656 978	6,9	34 542	520 785	6,6
1997	40 524	625 418	6,5	35 118	533 673	6,6
1998	43 445	670 383	6,5	34 846	537 662	6,5
1999	44 187	723 247	6,1	34 499	548 846	6,3
2000	51 563	793 993	6,5	33 875	566 119	6,0

Source: Stats SA (South African Statistics 2001)

Similarly, the mining and quarrying industry's contribution to non-agricultural business employment declined from 33,8 percent in 1980 to 26,3 percent in 2000 (cf. table 2, p.15 and figure 2, p.14).

**Figure 2 - Employment in the mining and quarrying industry compared to non-agricultural business sector employment for South Africa: 1980-2000 (1 000)**



Source: Stats SA (South African Statistics 2001)

**Table 2 - Employment in the mining and quarrying industry compared to non-agricultural business sector employment in South Africa: 1980-2000 (1 000)**

Year	Mining and quarrying	Formal non-agric business	Percentage contribution
1980	709 042	2 097 267	33,8
1981	722 918	2 242 810	32,2
1982	702 041	2 322 473	30,2
1983	700 901	2 200 792	31,8
1984	711 511	2 206 077	32,3
1985	724 587	2 136 556	33,9
1986	756 637	2 127 299	35,6
1987	736 319	2 144 411	35,6
1988	732 522	2 192 874	33,4
1989	706 810	2 186 070	32,3
1990	692 900	2 173 322	31,9
1991	653 134	2 100 709	31,1
1992	607 950	2 028 810	30,0
1993	561 655	1 974 572	28,4
1994	613 584	1 827 963	33,6
1995	599 885	1 951 412	30,7
1996	563 396	1 935 439	29,1
1997	558 256	1 858 157	30,0
1998	462 166	1 674 219	27,6
1999	441 459	1 589 928	27,8
2000	412 758	1 569 537	26,3

Source: Stats SA (South African Statistics 2001)

## 5. Physical accounts for South Africa's mining industry

This section gives the physical accounts for South Africa's three most prominent mining industries i.e. gold, platinum and coal.

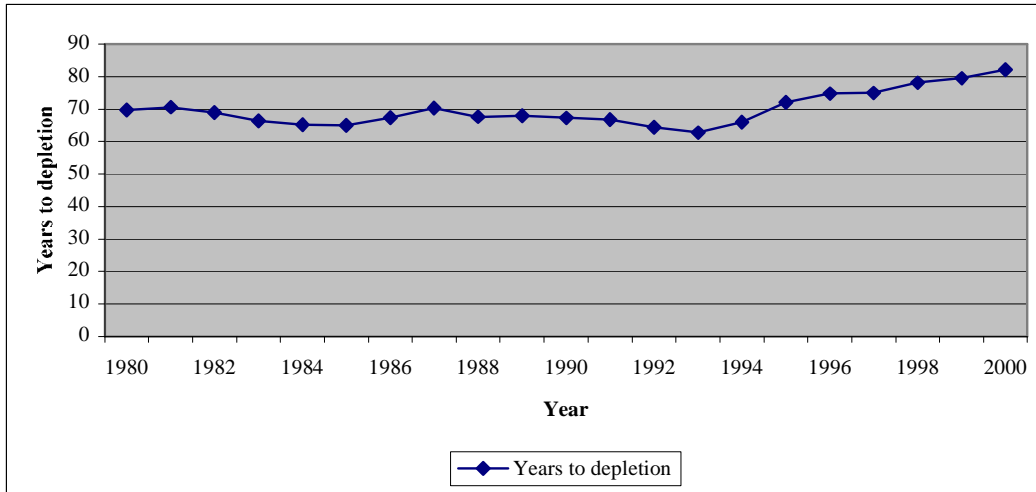
### 5.1 Gold

Table 3 (p. 17) shows the physical account for gold in South Africa from 1980 to 2000. Gold production (extraction) declined over this period from 675,1 tons in 1980 to 430,9 tons in 2000. At current extraction rates gold reserves in South Africa can last for another 82 years (cf. table 3, p.17 and figure 3, p.16).

The following calculations were done in the compilation of table 3 (p. 17):

The closing stock data in the physical account (column 6) is the proven economic reserve for gold in 1999, as indicated by the Department of Minerals and Energy in the South African Minerals Industry 1999/2000 report. Opening stock for 1999 was calculated as the proven economic reserve for gold in 1999 (35 877t) minus the production (extraction) of gold for 1999 (451,3t) and is equal to the closing stock for 1998 (closing stock 1998 = opening stock 1999 etc). Net change in inventories for gold is the difference between production (extraction) and the volume sold. Years to depletion are calculated as the ratio of closing stock divided by production (extraction). Discoveries are indicated as "not available" (Na) in the table due to the sensitive nature of the data.

**Figure 3 - Gold: Years to depletion for South Africa: 1980-2000**



Source: Department of Minerals and Energy (SAMI 1999/2000 and Statistical Tables 1980-2000)

## 5.2 Platinum

Table 4 (p. 20) shows the physical account for platinum in South Africa from 1980 to 2000. Platinum production (extraction) increased over this period from 114,3 tons in 1980 to 206,8 tons in 2000. At current extraction rates platinum reserves can last for another 303 years (cf. table 4, p.20 and figure 4, p.19). Years to depletion for platinum have declined over the 20-year period from 574 years in 1980 to 303 years in 2000.

The following calculations were done in the compilation of table 4 (p. 20):

The closing stock data in the physical accounts (column 6) is the proven economic reserve for platinum in 1999, as indicated by the Department of Minerals and Energy in the South African Minerals Industry 1999/2000 report. Opening stock for 1999 was calculated as the proven economic reserve for platinum in 1999 (62 816t) minus the production (extraction) of platinum for 1999 (216,5t) and is equal to the closing stock for 1998 (closing stock 1998 = opening stock 1999 etc). Net change in inventories for platinum is the difference between production (extraction) and the volume sold. Years to depletion are calculated as the ratio of closing stock divided by production (extraction). Discoveries are indicated as “not available” (Na) in the table due to the sensitive nature of the data.



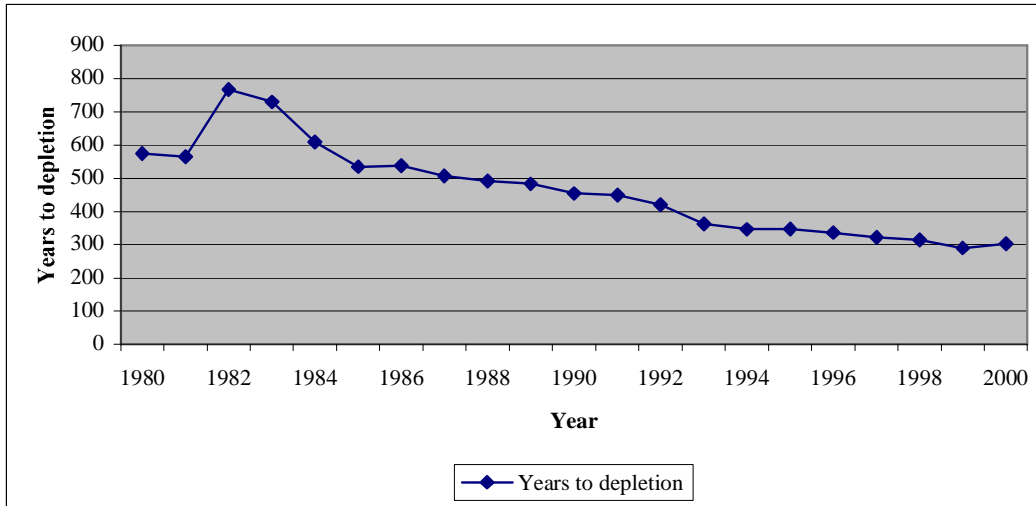
**Table 3 - Gold: Physical accounts for South Africa: 1980-2000 (ton)**

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

Na: not available

Source: Department of Minerals and Energy (SAMI 1999/2000 and Statistical Tables 1980-2000).

**Figure 4 - Platinum: Years to depletion for South Africa: 1980-2000**



Source: Department of Minerals and Energy (SAMI 1999/2000 and Statistical Tables 1980-2000).

### 5.3 Coal

Table 5 (p. 22) shows the physical account for coal in South Africa from 1980 to 2000. Coal production (extraction) has increased over this period from 115,0 million tons in 1980 to 224,3 million tons in 2000. At current extraction rates coal reserves in South Africa can last for another 246 years (cf. table 5, p.22 and figure 5, p.21). Years to depletion for coal declined over the 20-year period from 511 years in 1980 to 246 years in 2000.

The following calculations were done in the compilation of table 5 (p. 22):

The closing stock data in the physical accounts (column 6) is the proven economic reserve for coal in 1999, as indicated by the Department of Minerals and Energy in the South African Minerals Industry 1999/2000 report. Opening stock for 1999 was calculated as the proven economic reserve for coal in 1999 (55 333mt) minus the production (extraction) of coal for 1999 (223,3mt) and is equal to the closing stock for 1998 (closing stock 1998 = opening stock 1999 etc). Net change in inventories for coal is the difference between production (extraction) and the volume sold. Years to depletion are calculated as the ratio of closing stock divided by production (extraction). Discoveries are indicated as “not available” (Na) in the table due to the sensitive nature of the data.

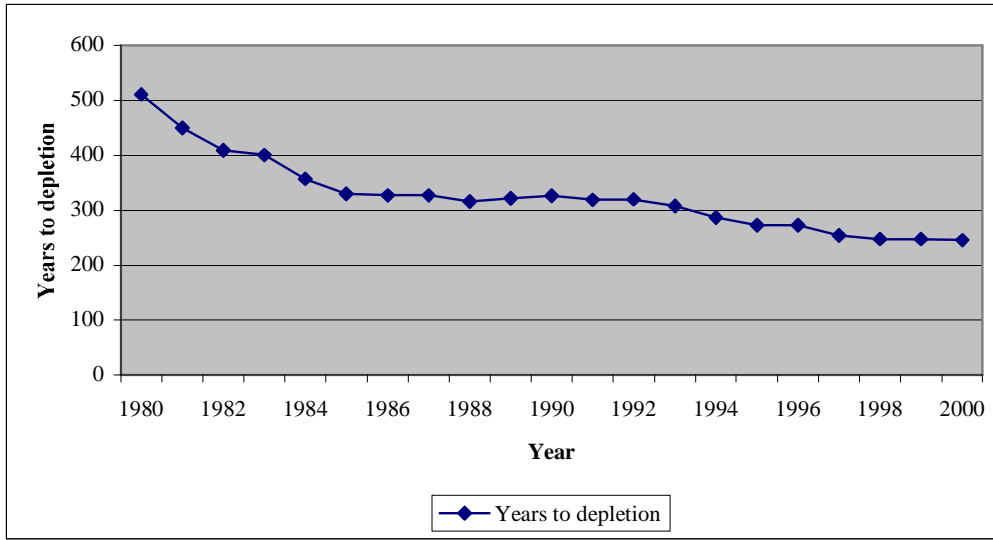
**Table 4 - Platinum: Physical accounts for South Africa: 1980-2000 (ton)**

Year	Opening Stock	Production (extraction)	Discoveries	Other volume changes	Closing Stock (sub-soil assets)	Volume sold	Net change in inventories	Closing stock (incl. inventories)	Years to depletion
1	2	3	4	5	6	7	8	9	10
1980	65 746,1	114,3	Na	-	65 631,8	112,1	2,2	65 634,0	574
1981	65 631,8	115,9	Na	-	65 515,9	103,5	12,4	65 528,3	565
1982	65 515,9	85,2	Na	-	65 430,7	98,2	-13,0	65 417,7	768
1983	65 430,7	89,5	Na	-	65 341,2	103,5	-14,0	65 327,2	730
1984	65 341,2	107,0	Na	-	65 234,2	112,5	-5,5	65 228,7	610
1985	65 234,2	121,7	Na	-	65 112,5	118,1	3,6	65 116,1	535
1986	65 112,5	120,5	Na	-	64 992,0	120,4	0,1	64 992,1	539
1987	64 992,0	128,0	Na	-	64 864,0	130,1	-2,1	64 861,9	507
1988	64 864,0	131,7	Na	-	64 732,3	130,9	0,8	64 733,1	492
1989	64 732,3	133,7	Na	-	64 598,6	137,3	-3,6	64 595,0	483
1990	64 598,6	141,9	Na	-	64 466,7	135,6	6,3	64 463,0	454
1991	64 456,7	142,9	Na	-	64 313,8	141,1	1,8	64 315,6	450
1992	64 313,8	152,9	Na	-	64 160,9	137,1	15,8	64 176,7	420
1993	64 160,9	176,2	Na	-	63 984,7	153,7	22,5	64 007,2	636
1994	63 984,7	183,9	Na	-	63 800,8	162,2	21,7	63 822,5	347
1995	63 800,8	183,1	Na	-	63 617,7	175,2	7,9	63 625,6	347
1996	63 617,7	188,6	Na	-	63 429,1	184,0	4,6	63 433,7	336
1997	63 429,1	196,6	Na	-	62 323,5	187,2	9,4	63 241,9	322
1998	62 323,5	200,0	Na	-	63 032,5	193,5	6,5	63 039,0	315
1999	63 032,5	216,5	Na	-	<b>62 816,0</b>	198,7	17,8	62 833,8	290
2000	62 816,0	206,8	Na	-	62 609,2	198,9	7,9	62 617,1	303

Na: not available

Source: Department of Minerals and Energy (SAMI 1999/2000 and Statistical Tables 1980-2000)

**Figure 5 - Coal: Years to depletion for South Africa: 1980-2000**



Source: Department of Minerals and Energy (SAMI 1999/2000 and Statistical Tables 1980-2000)

Uncertainty prevails over the reliability/statistical correctness of official figures regarding proven reserves published in the South Africa's Mineral Industry (SAMI) by the Department of Minerals and Energy. Additional research indicates that these figures are an over estimation of the true reserve base available. The figures for the SAMI report were derived by the Minerals Bureau at the Department of Minerals and Energy using their 1982 model (projection). Work is currently underway at the Mineral Bureau to get more reliable data concerning the coal reserves, but results are only expected in the middle of 2003. Unpublished data for coal reserves for the period 1982 to 2001, obtained from the Department of Minerals and Energy however, gives a more accurate reflection of these reserves. Table 6 (p. 24) therefore shows the alternative physical accounts for coal using the unpublished data received from the Department of Minerals and Energy.

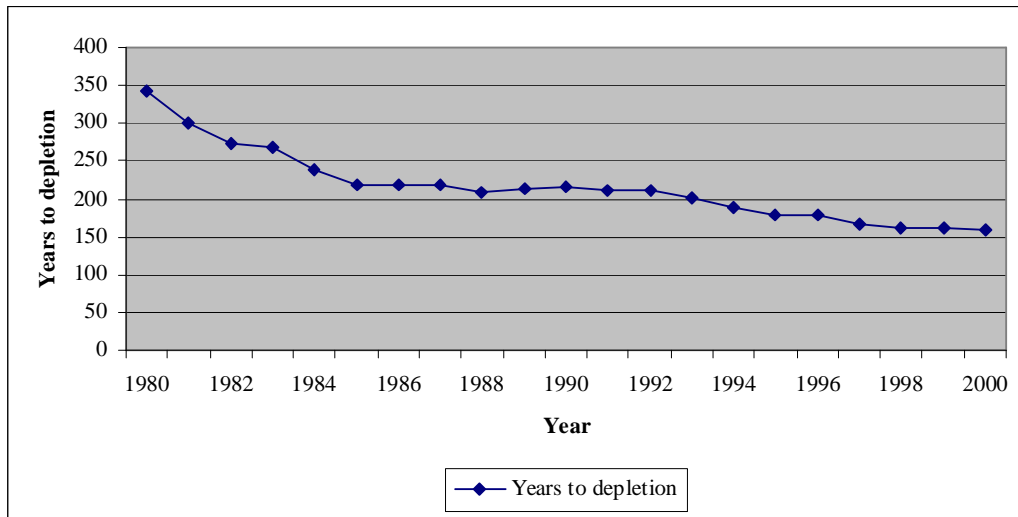
**Table 5 - Coal: Physical accounts for South Africa: 1980-2000 (million ton)**

Year	Opening Stock	Production (extraction)	Discoveries	Other volume changes	Closing Stock (sub-soil assets)	Volume sold	Net change in inventories	Closing stock (incl. inventories)	Years to depletion
1	2	3	4	5	6	7	8	9	10
1980	58 906,4	115,0	Na	-	58 791,4	113,1	1,9	58 793,3	511
1981	58 791,4	130,3	Na	-	58 661,1	129,9	0,4	58 661,5	450
1982	58 661,1	143,0	Na	-	58 518,1	140,3	2,7	58 520,8	409
1983	58 518,1	145,6	Na	-	58 372,5	144,6	1,0	58 373,5	401
1984	58 372,5	162,8	Na	-	58 209,7	161,3	1,5	58 211,2	358
1985	58 209,7	175,9	Na	-	58 033,8	171,9	4,0	58 037,8	330
1986	58 033,8	176,8	Na	-	57 857,0	174,3	2,5	57 859,5	327
1987	57 857,0	176,1	Na	-	57 680,9	172,6	3,5	57 684,4	328
1988	57 680,9	181,8	Na	-	57 449,1	183,7	-1,9	57 497,2	316
1989	57 499,1	177,8	Na	-	57 321,3	179,9	-2,1	57 319,2	322
1990	57 321,3	174,9	Na	-	57 146,4	185,4	-10,5	57 135,9	327
1991	57 146,4	178,5	Na	-	56 967,9	181,9	-3,4	56 964,5	319
1992	56 967,9	177,4	Na	-	56 790,5	179,2	-1,8	56 788,7	320
1993	56 790,5	183,9	Na	-	56 606,6	184,0	-0,1	56 606,5	308
1994	56 606,6	196,5	Na	-	56 410,1	193,7	2,8	56 412,9	287
1995	56 410,1	205,6	Na	-	56 204,5	205,7	-0,1	56 204,4	273
1996	56 204,5	205,0	Na	-	55 999,5	206,2	-1,2	55 998,3	273
1997	55 999,5	219,3	Na	-	55 780,2	217,1	2,2	55 782,4	254
1998	55 780,2	223,9	Na	-	55 556,3	223,0	0,9	55 557,2	248
1999	55 556,3	223,3	Na	-	<b>55 333,0</b>	221,7	1,6	55 334,6	248
2000	55 333,0	224,3	Na	-	55 108,7	223,0	1,3	55 110,0	246

Na: not available

Source: Department of Minerals and Energy (SAMI 1999/2000 and Statistical Tables 1980-2000)

**Figure 6 - Coal: Years to depletion for South Africa: 1980-2000**



Source: Department of Minerals and Energy

Table 7 (p. 25) and figure 7 (p. 27) shows the comparison between the two coal physical accounts, for the published and the unpublished data received from the Department of Minerals and Energy.

**Table 6 - Coal: Physical accounts for South Africa: 1980-2000 (million ton)**

Year	Opening Stock	Production (extraction)	Discoveries	Other volume changes	Closing Stock (sub-soil assets)	Volume sold	Net change in inventories	Closing stock (incl. inventories)	Years to depletion
1980	39 509,3	115,0	Na	-	39 394,3	113,1	1,9	39 396,2	343
1981	39 394,3	130,3	Na	-	39 264,0	129,9	0,4	39 264,4	301
1982	39 264,0	143,0	Na	-	<b>39 121,0</b>	140,3	2,7	39 123,7	274
1983	39 121,0	145,6	Na	-	38 975,4	144,6	1,0	38 976,4	268
1984	38 975,4	162,8	Na	-	38 812,6	161,3	1,5	38 814,1	238
1985	38 812,6	175,9	Na	-	38 636,7	171,9	4,0	38 640,7	220
1986	38 636,7	176,8	Na	-	38 459,9	174,3	2,5	38 462,4	218
1987	38 459,9	176,1	Na	-	38 283,8	172,6	3,5	38 287,3	217
1988	38 283,8	181,8	Na	-	38 102,0	183,7	-1,9	38 100,1	210
1989	38 102,0	177,8	Na	-	37 924,2	179,9	-2,1	37 922,1	213
1990	37 924,2	174,9	Na	-	37 749,3	185,4	-10,5	37 738,8	216
1991	37 749,3	178,5	Na	-	37 570,8	181,9	-3,4	37 567,4	210
1992	37 570,8	177,4	Na	-	37 393,4	179,2	-1,8	37 391,6	211
1993	37 393,4	183,9	Na	-	37 209,5	184,0	-0,1	37 209,4	202
1994	37 209,5	196,5	Na	-	37 013,0	193,7	2,8	37 015,8	188
1995	37 013,0	205,6	Na	-	36 807,4	205,7	-0,1	36 807,3	179
1996	36 807,4	205,0	Na	-	36 602,4	206,2	-1,2	36 601,2	179
1997	36 602,4	219,3	Na	-	36 383,1	217,1	2,2	36 385,3	166
1998	36 383,1	223,9	Na	-	36 159,2	223,0	0,9	36 160,1	161
1999	36 159,2	223,3	Na	-	<b>35 935,9</b>	221,7	1,6	35 937,5	161
2000	35 935,9	224,3	Na	-	35 711,6	223,0	1,3	35 712,9	159

Na: not available

Source: Department of Minerals and Energy

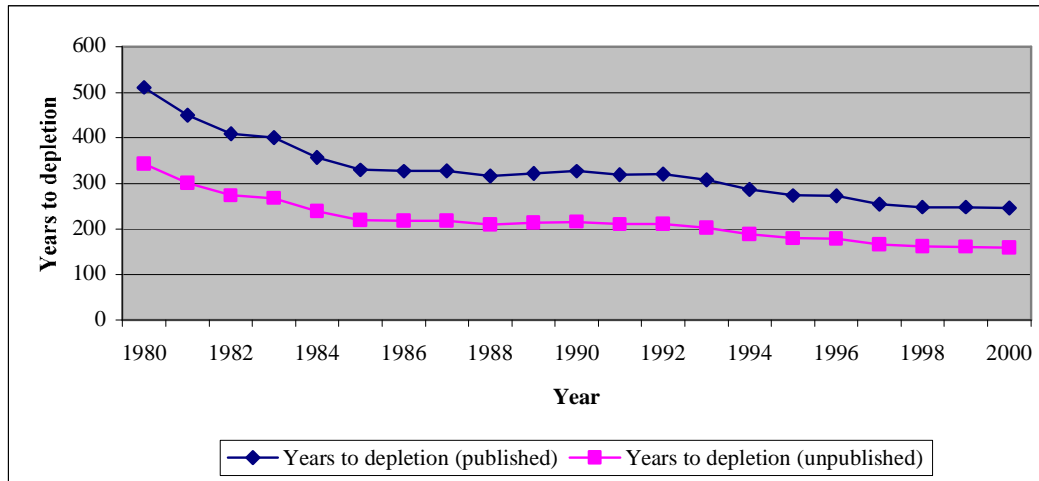
**Table 7 - Comparison of results from the two coal physical accounts: 1980-2000 (million ton)**

Year	Opening stock (SAMI)	Opening stock (unpublished data)	Closing stock (SAMI)	Closing stock (unpublished data)	Years to depletion (SAMI)	Years to depletion (unpublished data)
1980	58 906.4	39 509.3	58 791.4	39 394.3	511	343
1981	58 791.4	39 394.3	58 661.1	39 264.0	450	301
1982	58 661.1	39 264.0	58 518.1	<b>39 121.0</b>	409	274
1983	58 518.1	39 121.0	58 372.5	38 975.4	401	268
1984	58 372.5	38 975.4	58 209.7	38 812.6	358	238
1985	58 209.7	38 812.6	58 033.8	38 636.7	330	220
1986	58 033.8	38 636.7	57 857.0	38 459.9	327	218
1987	57 857.0	38 459.9	57 680.9	38 283.8	328	217
1988	57 680.9	38 283.8	57 449.1	38 102.0	316	210
1989	57 499.1	38 102.0	57 321.3	37 924.2	322	213
1990	57 321.3	37 924.2	57 146.4	37 749.3	327	216
1991	57 146.4	37 749.3	56 967.9	37 570.8	319	210
1992	56 967.9	37 570.8	56 790.5	37 393.4	320	211
1993	56 790.5	37 393.4	56 606.6	37 209.5	308	202
1994	56 606.6	37 209.5	56 410.1	37 013.0	287	188
1995	56 410.1	37 013.0	56 204.5	36 807.4	273	179
1996	56 204.5	36 807.4	55 999.5	36 602.4	273	179
1997	55 999.5	36 602.4	55 780.2	36 383.1	254	166
1998	55 780.2	36 383.1	55 556.3	36 159.2	248	161
1999	55 556.3	36 159.2	<b>55 333.0</b>	<b>35 935.9</b>	248	161
2000	55 333.0	35 935.9	55 108.7	35 711.6	246	159

Source: Department of Minerals and Energy (SAMI 1999/2000 and Statistical Tables 1980-2000)



**Figure 7 - Comparison of results of years to depletion from the two coal physical accounts: 1980-2000**



Source: Department of Minerals and Energy (SAMI 1999/2000 and Statistical Tables 1980-2000)

From figure 7 (p. 27) above, it can be seen that both lines follow the same curve, with the line of the published data having higher values (more years to depletion) than that of the line of the unpublished data.

## 6. Resource rent for South Africa’s mining industry

This section provides the calculations for resource rent for South Africa’s three most prominent mining industries i.e. gold, platinum and coal, as well as for other and total mining.

### 6.1 Gold

Table 8 (p.28) shows the resource rent as well as other calculations for gold for the period 1980 to 2000. Gold output (sales) increased from R 10 395 million in 1980 to R 25 272 million in 2000, while the unit rent decreased over the same period from R 10 249 per kg in 1980 to R 318 per kg in 2000 (cf. figure 8, p.31)

Intermediate consumption was obtained from various Census of Mining publications obtained from Stats SA. The census is done every three years (e.g. 1990, 1993, 1996). Data for the in between years of the census were extrapolated. Opportunity cost of capital, rent and unit rent were calculated using both a social discount rate of 3 percent and 5 percent. Consumption of capital and opportunity cost of capital was calculated using the replacement values shown in Annexure A (p. 67)

**Table 8 - Gold: Resource rent and other calculations for South Africa at current prices: 1980-2000 (R million)**

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988
<b>Output (sales)</b>	10 395	8 554	8 778	10 177	11 574	15 291	17 283	17 495	19 701
<b>Intermediate consumption</b>	1 554	1860	2 379	2 639	3 028	3 822	4 219	4 814	5 372
<b>Compensation of employees (total)</b>	1 448	1 793	2 098	2 438	2 844	3 311	3 949	4 851	5 491
<b>Compensation of employees (male)</b>	1 430	1 769	2 068	2 402	2 801	3 255	3 880	4 761	5 388
<b>Compensation of employees (female)</b>	18	24	30	36	43	56	69	90	103
<b>Consumption of capital</b>	306	385	478	575	658	817	1 074	1 262	1 527
<b>Opportunity cost of capital (SDR 3%)</b>	173	223	279	339	394	495	651	752	902
<b>Opportunity cost of capital (SDR 5%)</b>	289	372	464	565	657	826	1 085	1 254	1 504
<b>Rent (SDR 3%)</b>	6 913	4 293	3 544	4 186	4 650	6 846	7 390	5 816	6 409
<b>Rent (SDR 5%)</b>	6 798	4 144	3 358	3 961	4 387	6 515	6 957	5 314	5 807
<b>Unit Rent (R/kg) (SDR 3%)</b>	10 240	6 359	5 250	6 365	6 999	10 071	10 838	8 642	10 013
<b>Unit Rent (R/kg) (SDR 5%)</b>	10 069	6 301	5 055	5 827	6 434	9 682	10 870	8 793	9 367

**Table 8 - Gold: Resource rent and other calculations for South Africa at current prices: 1980-2000 (R million) (continue)**

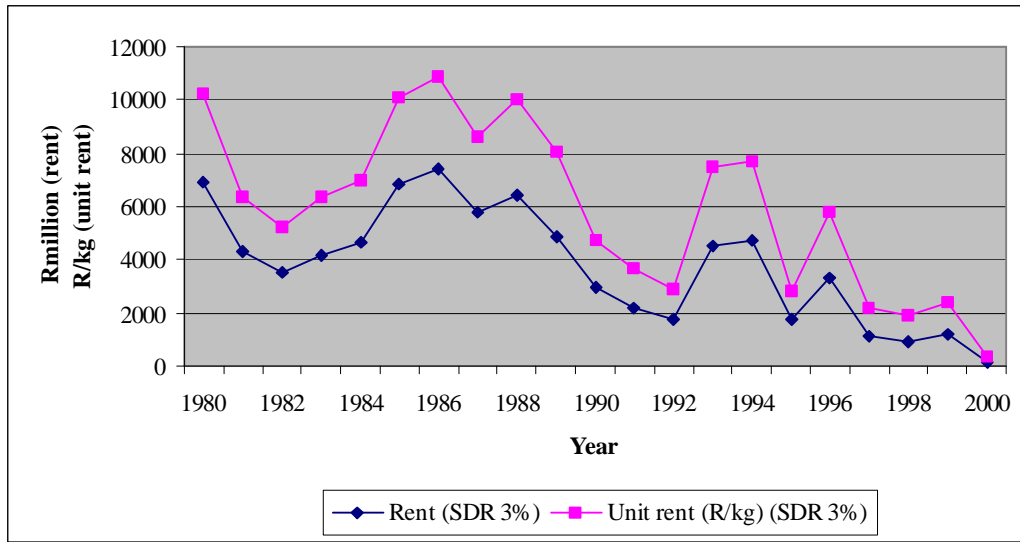
<b>Year</b>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>
<b>Output (sales)</b>	19 439	18 994	19 296	19 513	23 239	24 953	23 456	26 468	24 905
<b>Intermediate consumption</b>	5 651	6 069	6 579	6 834	7 216	7 957	8 327	8 883	8 358
<b>Compensation of employees (total)</b>	6 081	6 715	6 850	6 940	7 200	7 612	8 287	8 794	9 599
<b>Compensation of employees (male)</b>	5 964	6 581	6 701	6 795	7 050	7 462	8 102	8 589	9 376
<b>Compensation of employees (female)</b>	117	134	149	145	150	150	185	205	223
<b>Consumption of capital</b>	1 776	2 069	2 331	2 567	2 808	3 090	3 382	3 661	3 948
<b>Opportunity cost of capital (SDR 3%)</b>	1 053	1 201	1 318	1 411	1 499	1 595	1 693	1 779	1 862
<b>Opportunity cost of capital (SDR 5%)</b>	1 756	2 002	2 196	2 352	2 498	2 659	2 822	2 964	3 103
<b>Rent (SDR 3%)</b>	4 878	2 940	2 218	1 761	4 516	4 699	1 766	3 352	1 138
<b>Rent (SDR 5%)</b>	4 176	2 139	1 340	821	3 517	3 636	638	2 166	-103
<b>Unit Rent (R/kg) (SDR 3%)</b>	8 072	4 743	3 650	2 911	7 515	7 666	2 852	5 776	2 172
<b>Unit Rent (R/kg) (SDR 5%)</b>	6 871	3 536	2 229	1 339	5 679	6 266	1 217	4 346	-211

**Table 8. Gold: Resource rent and other calculations for South Africa at current prices: 1980-2000 (R million) (concluded)**

<b>Year</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>
<b>Output (sales)</b>	24 295	24 990	25 272
<b>Intermediate consumption</b>	8 154	8 387	8 627
<b>Compensation of employees (total)</b>	9 205	9 140	9 772
<b>Compensation of employees (male)</b>	8 999	8 942	9 549
<b>Compensation of employees (female)</b>	206	198	223
<b>Consumption of capital</b>	4 125	4 370	4 734
<b>Opportunity cost of capital (SDR 3%)</b>	1 875	1 917	2 002
<b>Opportunity cost of capital (SDR 5%)</b>	3 125	3 195	3 337
<b>Rent (SDR 3%)</b>	936	1 176	137
<b>Rent (SDR 5%)</b>	-314	-102	-1 198
<b>Unit Rent (R/kg) (SDR 3%)</b>	1 879	2 397	318
<b>Unit Rent (R/kg) (SDR 5%)</b>	-675	-227	-2 779

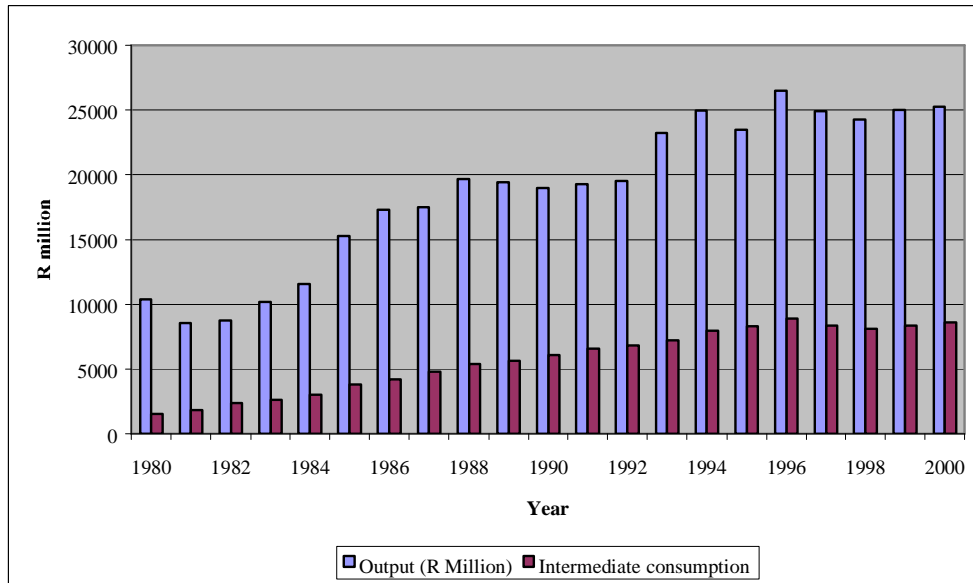
Source: Department of Minerals and Energy (Statistical Tables 1980-2000), Stats SA Census of Mining

**Figure 8 - Gold: Resource and unit rent for South Africa: 1980-2000 (R million and R/kg)**



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

**Figure 9 - Gold: Output and intermediate consumption: 1980-2000 (R million)**



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

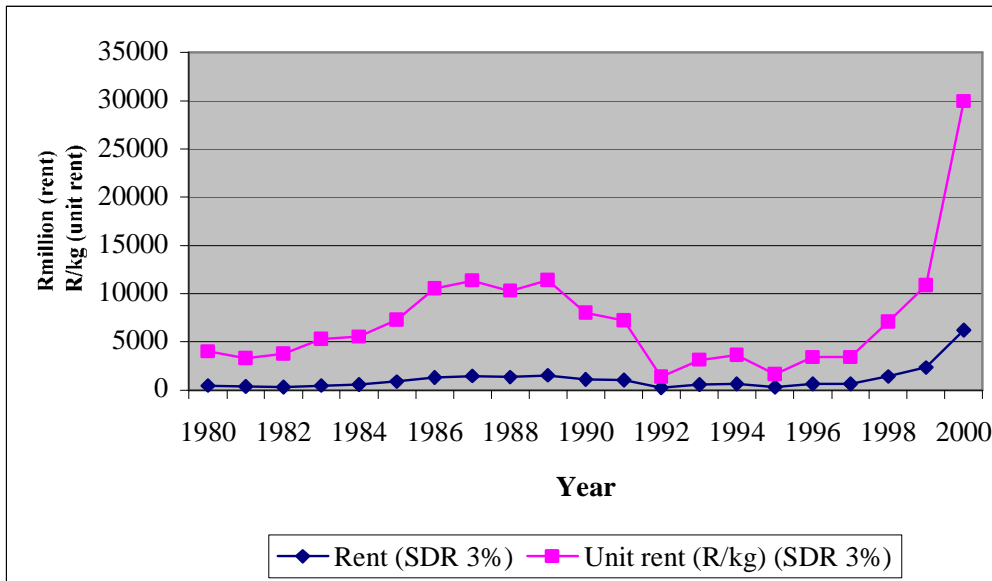
Figure 9 (p. 31) shows an increase in the output of the gold mining industry over the period 1980 to 2000. Similarly, intermediate consumption also increased over the period from R 1 554 million in 1980 to R 8 627 million in 2000.

## 6.2 Platinum

Table 9 (p. 33) shows the resource rent as well as other calculations for platinum for the period 1980 to 2000. Platinum output (sales) increased from R 851 million in 1980 to R 27 095 million in 2000, while the unit rent also increased over the same period from R 3 997 per kg in 1980 to R 29 947 per kg in 2000 (cf. figure 10, p.32)

Intermediate consumption was obtained from various Census of Mining publications obtained from Stats SA. The census is done every three years (e.g. 1990, 1993, 1996). Data for the in between years of the census were extrapolated. Opportunity cost of capital, rent and unit rent were calculated using both a social discount rate of 3 percent and 5 percent. Consumption of capital and opportunity cost of capital was calculated using the replacement values shown in Annexure A (p. 67). 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).

**Figure 10 - Platinum: Resource and unit rent for South Africa: 1980-2000 (R million and R/kg)**



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

**Table 9 - Platinum: Resource rent and other calculations for South Africa at current prices: 1980-2000 (R million)**

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988
<b>Output (sales)</b>	851	937	852	1 118	1 432	1 998	2 964	3 581	3 813
<b>Intermediate consumption</b>	128	206	230	291	372	500	830	967	1 030
<b>Compensation of employees (total)</b>	224	278	235	254	341	450	570	768	933
<b>Compensation of employees (male)</b>	221	273	231	250	337	444	564	758	921
<b>Compensation of employees (female)</b>	3	5	4	4	4	6	6	10	12
<b>Consumption of capital</b>	26	47	43	67	86	100	178	251	305
<b>Opportunity cost of capital (SDR 3%)</b>	17	28	26	34	43	60	119	143	191
<b>Opportunity cost of capital (SDR 5%)</b>	26	37	43	67	86	100	178	251	305
<b>Rent (SDR 3%)</b>	457	378	319	473	590	889	1 268	1 452	1 355
<b>Rent (SDR 5%)</b>	448	369	302	439	547	849	1 208	1 345	1 240
<b>Unit Rent (R/kg) (SDR 3%)</b>	3 997	3 261	3 742	5 282	5 512	7 302	10 520	11 345	10 287
<b>Unit Rent (R/kg) (SDR 5%)</b>	3 922	3 180	3 542	4 907	5 111	6 974	10 028	10 506	9 418

**Table 9 - Platinum: Resource rent and other calculations for South Africa at current prices: 1980-2000 (R million)(continue)**

<b>Year</b>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>
<b>Output (sales)</b>	4 611	5 164	5 692	4 678	5 189	5 810	6 573	7 486	8 510
<b>Intermediate consumption</b>	1 337	1 652	1 935	1 637	1 609	1 859	2 366	2 545	2 893
<b>Compensation of employees (total)</b>	1 106	1 500	1 645	1 894	2 099	2 241	2 522	2 725	2 992
<b>Compensation of employees (male)</b>	1 090	1 468	1 619	1 861	2 067	2 199	2 471	2 664	2 931
<b>Compensation of employees (female)</b>	16	32	26	33	32	42	51	61	61
<b>Consumption of capital</b>	415	568	683	608	623	697	920	1 048	1 362
<b>Opportunity cost of capital (SDR 3%)</b>	231	310	398	327	311	349	460	524	596
<b>Opportunity cost of capital (SDR 5%)</b>	415	568	626	561	571	639	789	823	1 021
<b>Rent (SDR 3%)</b>	1 522	1 134	1 030	211	547	664	304	644	667
<b>Rent (SDR 5%)</b>	1 388	875	803	-23	288	374	-24	344	242
<b>Unit Rent (R/kg) (SDR 3%)</b>	11 386	7 989	7 210	1 381	3 107	3 611	1 662	3 413	3 394
<b>Unit Rent (R/kg) (SDR 5%)</b>	10 006	6 169	5 616	-149	1 634	2 031	-132	1 825	1 230

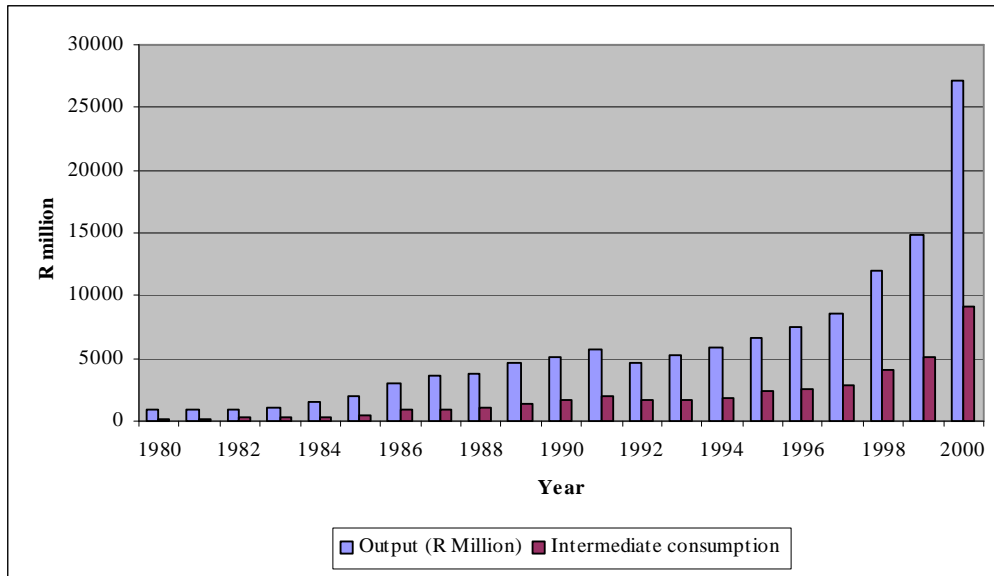


**Table 9. Platinum: Resource rent and other calculations for South Africa at current prices: 1980-2000 (R million)(concluded)**

<b>Year</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>
<b>Output (sales)</b>	11 930	14 887	27 095
<b>Intermediate consumption</b>	4 056	5 062	9 212
<b>Compensation of employees (total)</b>	3 474	3 755	4 374
<b>Compensation of employees (male)</b>	3 392	3 666	4 278
<b>Compensation of employees (female)</b>	82	89	96
<b>Consumption of capital</b>	2 028	2 531	5 148
<b>Opportunity cost of capital (SDR 3%)</b>	954	1 191	2 168
<b>Opportunity cost of capital (SDR 5%)</b>	1 551	1 935	3 522
<b>Rent (SDR 3%)</b>	1 417	2 349	6 193
<b>Rent (SDR 5%)</b>	821	1 604	4 839
<b>Unit Rent (R/kg) (SDR 3%)</b>	7 086	10 848	29 947
<b>Unit Rent (R/kg) (SDR 5%)</b>	4 104	7 410	23 399

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

**Figure 11 - Platinum: Output and intermediate consumption: 1980-2000 (R million)**



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

Figure 11 (p. 37) shows an increase in the output of the platinum mining industry over the period from R 851 million in 1980 to R 27 095 in 2000. Similarly, intermediate consumption also increased over the period from 1980 to 2000.

### 6.3 Coal

Table 10 (p. 38) shows the resource rent as well as other calculations for coal for the period 1980 to 2000. Coal output (sales) increased from R 1 497 million in 1980 to R 19 703 million in 2000, while the unit rent also increased over the same period from R 3 per kg in 1980 to R 37 per kg in 2000. (cf. figure 12, p.41)

Intermediate consumption was obtained from various Census of Mining publications, obtained from Stats SA. The census is done every three years (e.g. 1990, 1993, 1996). Data for the in between years of the census were extrapolated. Opportunity cost of capital, rent and unit rent were calculated using both a social discount rate of 3 percent and 5 percent. Consumption of capital and opportunity cost of capital was calculated using the replacement values shown in Annexure A (p. 67)

**Table 10 - Coal: Resource rent and other calculations for South Africa at current prices: 1980-2000 (R million)**

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988
<b>Output (sales)</b>	1 497	2 146	2 653	2 651	3 747	5 102	5 433	4 846	5 952
<b>Intermediate consumption</b>	485	609	732	794	886	1 261	1 449	1 730	1 885
<b>Compensation of employees (total)</b>	567	738	792	803	903	1 064	1 246	1 383	1 545
<b>Compensation of employees (male)</b>	554	720	769	777	872	1 028	1 203	1 332	1 487
<b>Compensation of employees (female)</b>	13	18	23	26	31	36	43	51	58
<b>Consumption of capital</b>	55	73	96	121	143	184	243	286	356
<b>Opportunity cost of capital (SDR 3%)</b>	38	51	68	83	98	124	161	186	228
<b>Opportunity cost of capital (SDR 5%)</b>	63	85	113	139	164	207	269	310	380
<b>Rent (SDR 3%)</b>	352	675	965	850	1 444	2 468	2 334	1 261	1 938
<b>Rent (SDR 5%)</b>	327	641	920	794	1378	2385	2227	1137	1786
<b>Unit Rent (R/kg) (SDR 3%)</b>	3	6	8	7	11	17	16	8	11
<b>Unit Rent (R/kg) (SDR 5%)</b>	3	5	6	5	8	14	13	6	10

**Table 10 - Coal: Resource rent and other calculations for South Africa at current prices: 1980-2000 (R million)(continue)**

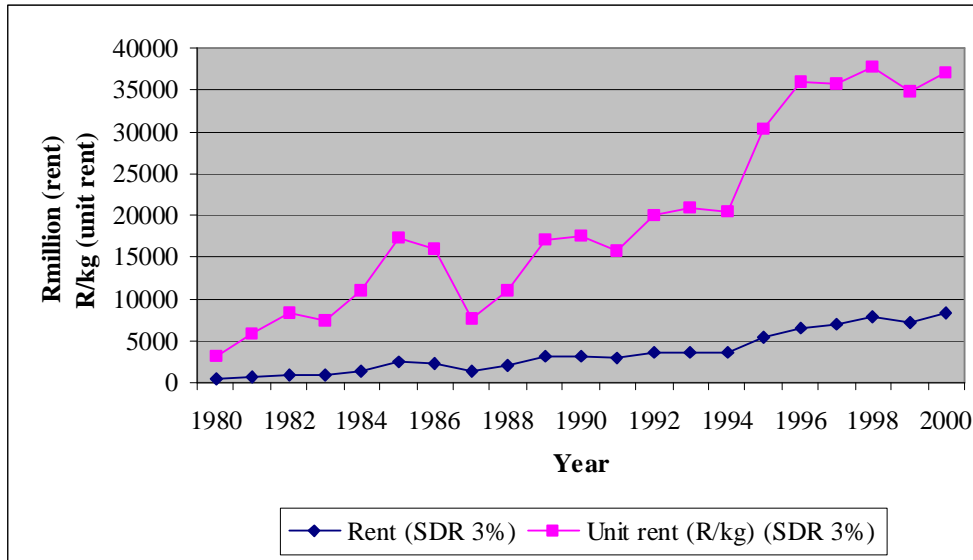
Year	1989	1990	1991	1992	1993	1994	1995	1996	1997
<b>Output (sales)</b>	7 569	8 173	8 785	9 424	9 714	10 353	12 818	14 891	16 268
<b>Intermediate consumption</b>	1 963	2 080	2 434	2 611	2 876	3 263	3 457	3 748	4 095
<b>Compensation of employees (total)</b>	1 870	2 125	2 440	2 080	1 878	2 021	2 370	2 765	3 204
<b>Compensation of employees (male)</b>	1 802	2 042	2 343	2 009	1 816	1 949	2 287	2 671	3 095
<b>Compensation of employees (female)</b>	68	83	97	71	62	72	83	94	109
<b>Consumption of capital</b>	430	534	645	728	814	911	1 019	1 145	1 269
<b>Opportunity cost of capital (SDR 3%)</b>	270	334	401	442	481	526	574	633	686
<b>Opportunity cost of capital (SDR 5%)</b>	450	557	668	736	802	876	956	1 056	1 144
<b>Rent (SDR 3%)</b>	3 036	3 100	2 865	3 564	3 665	3 632	5 398	6 600	7 014
<b>Rent (SDR 5%)</b>	2 856	2 877	2 598	3 269	3 344	3 281	5 015	6 177	6 557
<b>Unit Rent (R/kg) (SDR 3%)</b>	17	18	16	20	21	20	30	36	36
<b>Unit Rent (R/kg) (SDR 5%)</b>	16	16	15	18	18	17	24	30	30

**Table 10 - Coal: Resource rent and other calculations for South Africa at current prices: 1980-2000 (R million)(concluded)**

<b>Year</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>
<b>Output (sales)</b>	17 917	17 702	19 703
<b>Intermediate consumption</b>	4 510	4 456	4 564
<b>Compensation of employees (total)</b>	3 523	3 835	4 259
<b>Compensation of employees (male)</b>	3 399	3 702	4 073
<b>Compensation of employees (female)</b>	124	133	186
<b>Consumption of capital</b>	1 377	1 508	1 708
<b>Opportunity cost of capital (SDR 3%)</b>	729	780	873
<b>Opportunity cost of capital (SDR 5%)</b>	1 215	1 301	1 455
<b>Rent (SDR 3%)</b>	7 779	7 123	8 299
<b>Rent (SDR 5%)</b>	7 293	6 603	7 717
<b>Unit Rent (R/kg) (SDR 3%)</b>	38	35	37
<b>Unit Rent (R/kg) (SDR 5%)</b>	33	30	34

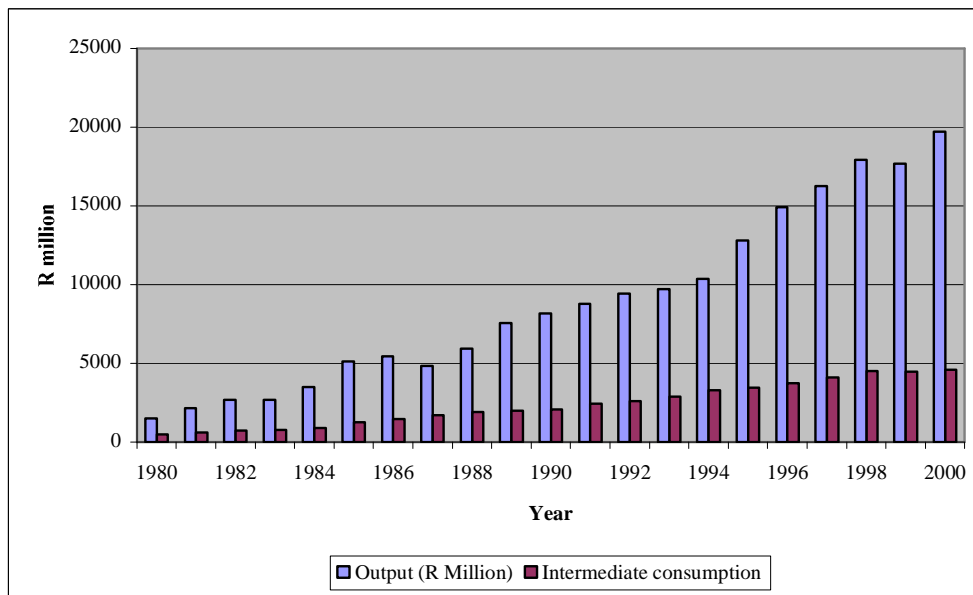
Source: Department of Minerals and Energy (Statistical Tables 1980-2000), Stats SA Census of Mining

**Figure 12 - Coal: Resource and unit rent for South Africa: 1980-2000 (R million and R/kg)**



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

**Figure 13 - Coal Output and intermediate consumption: 1980-2000 (R million)**



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

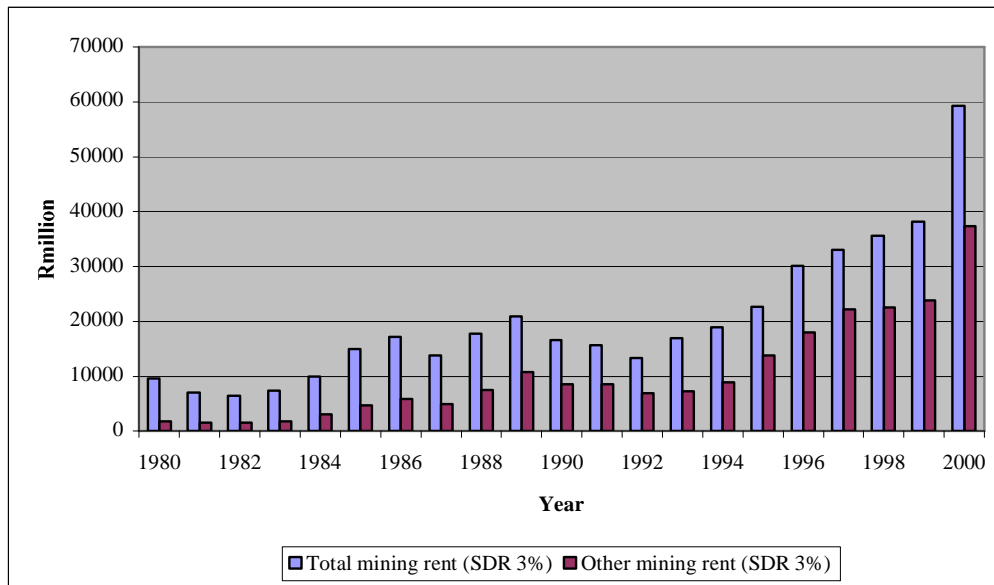
Figure 13 (p. 41) shows an increase in the output of the coal mining industry over the period from R 1 497 million in 1980 to R 19 703 in 2000. Similarly, intermediate consumption also increased over the period from 1980 to 2000.

## 6.4 Other Mining and quarrying

Table 11 (p. 43) shows the resource rent as well as other calculations for other mining and quarrying for the period 1980 to 2000. Other mining and quarrying output (sales) increased from R 3 417 million in 1980 to R 48 916 million in 2000, while the rent also increased over the same period from R 1 828 million in 1980 to R 37 396 in 2000 (cf. figure 14, p.42)

Intermediate consumption was obtained from various Census of Mining publications, obtained from Stats SA. The census is done every three years (e.g. 1990, 1993, 1996). Data for the in between years of the census were extrapolated. Opportunity cost of capital, rent and unit rent were calculated using both a social discount rate of 3 percent and 5 percent). Consumption of capital and opportunity cost of capital was calculated using the replacement values shown in Annexure A (p. 67).

**Figure 14 - Total mining and quarrying and other mining and quarrying: Resource rent for South Africa: 1980-2000 (R million)**



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

Rent for total mining and quarrying and other mining and quarrying showed an increase over the period 1980 to 2000 (cf. table 14, p.42).

**Table 11 - Other mining and quarrying: Resource rent and other calculations for South Africa at current prices: 1980-2000  
R million)**

<b>Year</b>	<b>1980</b>	<b>1981</b>	<b>1982</b>	<b>1983</b>	<b>1984</b>	<b>1985</b>	<b>1986</b>	<b>1987</b>	<b>1988</b>
<b>Output (sales)</b>	3 417	3 435	3 568	3 926	5 391	7 363	8 570	7 980	11 661
<b>Intermediate consumption</b>	643	705	724	686	638	789	597	669	1 297
<b>Compensation of employees (total)</b>	379	445	492	496	536	614	702	781	925
<b>Compensation of employees (male)</b>	367	431	473	476	511	590	673	749	884
<b>Compensation of employees (female)</b>	12	14	19	20	25	24	29	32	41
<b>Consumption of capital</b>	425	518	632	738	838	1 019	1 105	1 255	1 492
<b>Opportunity cost of capital (SDR 3%)</b>	142	165	197	223	245	289	278	323	388
<b>Opportunity cost of capital (SDR 5%)</b>	237	275	328	371	409	482	464	538	647
<b>Rent (SDR 3%)</b>	1 828	1 602	1 523	1 783	3 134	4 652	5 887	4 952	7 558
<b>Rent (SDR 5%)</b>	1 733	1 492	1 392	1 635	2 970	4 459	5 702	4 736	7 299



**Table 11 - Other mining and quarrying: Resource rent and other calculations for South Africa at current prices: 1980-2000  
(R million)(continue)**

<b>Year</b>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>
<b>Output (sales)</b>	15 718	14 628	14 704	13 752	14 255	16 715	22 264	27 251	33 448
<b>Intermediate consumption</b>	1 335	1 538	1 524	1 957	2 188	2 859	2 812	3 324	4 830
<b>Compensation of employees (total)</b>	1 210	1 480	1 685	1 742	1 650	1 767	2 306	2 601	2 849
<b>Compensation of employees (male)</b>	1 157	1 413	1 608	1 652	1 563	1 667	2 185	2 459	2 694
<b>Compensation of employees (female)</b>	53	67	77	90	87	100	121	142	155
<b>Consumption of capital</b>	1 862	2 105	2 309	2 413	2 403	2 417	2 459	2 465	2 547
<b>Opportunity cost of capital (SDR 3%)</b>	507	584	660	716	732	767	820	860	946
<b>Opportunity cost of capital (SDR 5%)</b>	845	973	1 100	1 193	1 219	1 279	1 367	1 433	1 576
<b>Rent (SDR 3%)</b>	10 804	8 562	8 526	6 924	7 282	8 905	13 867	18 001	22 276
<b>Rent (SDR 5%)</b>	10 466	8 173	8 086	6 446	6 794	8 393	13 320	17 428	21 646

**Table 11. Other mining and quarrying: Resource rent and other calculations for South Africa at current prices: 1980-2000 (R million)(concluded)**

<b>Year</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>
<b>Output (sales)</b>	34 655	37 193	48 916
<b>Intermediate consumption</b>	5 284	6 094	3 769
<b>Compensation of employees (total)</b>	3 038	3 333	3 684
<b>Compensation of employees (male)</b>	2 867	3 137	3 462
<b>Compensation of employees (female)</b>	171	196	222
<b>Consumption of capital</b>	2 675	2 748	2 788
<b>Opportunity cost of capital (SDR 3%)</b>	1 076	1 184	1 279
<b>Opportunity cost of capital (SDR 5%)</b>	1 793	1 973	2 131
<b>Rent (SDR 3%)</b>	22 582	23 834	37 396
<b>Rent (SDR 5%)</b>	21 865	23 045	36 544

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

## 6.5 Total Mining and quarrying

Table 12 (p. 48) shows the resource rent and other calculations for total mining and quarrying for the period 1980 to 2000. Total mining and quarrying output (sales) increased from R 16 160 million in 1980 to R 120 986 million in 2000, while the rent also increased over the same period from R 9 593 million in 1980 to R 59 341 in 2000 (cf. figure 14, p.42).

Intermediate consumption was obtained from various Census of Mining publications, obtained from Stats SA. The census is done every three years (e.g. 1990, 1993, 1996). Data for the in between years of the census were extrapolated. Opportunity cost of capital, rent and unit rent were calculated using both a social discount rate of 3 percent and 5 percent. Consumption of capital and opportunity cost of capital was calculated using the replacement values shown in Annexure A (p. 67)

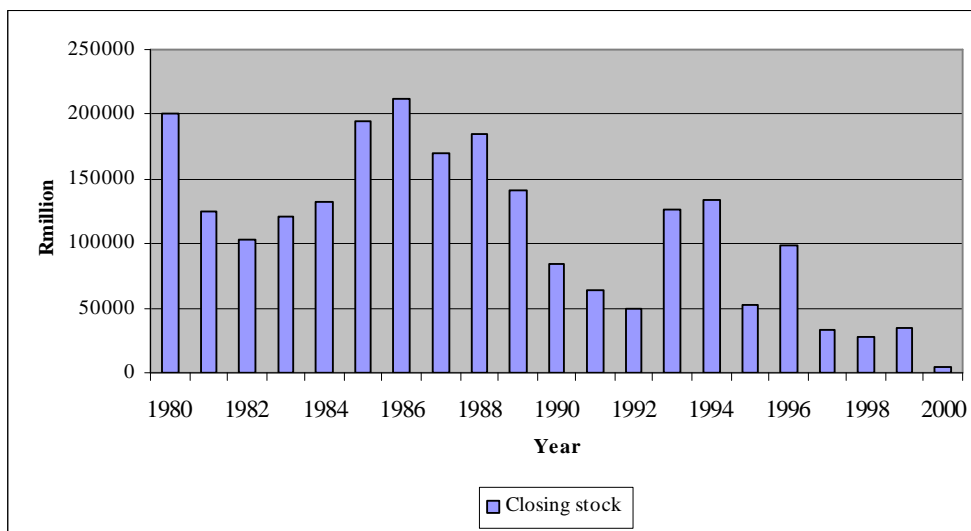
## 7. Monetary Accounts for South Africa's mining industry

This section describes the monetary accounts for South Africa's three most prominent mining industries i.e. gold, platinum and coal.

### 7.1 Gold

Table 13 (p. 51) and figure 15 (p. 47) show the monetary accounts for gold in South Africa for the period 1980 to 2000. The value of the country's gold reserves (stock) is steadily depreciating over the period from R 201 198 million in 1980 to R 4 165 million in 2000. This can be largely contributed to a decrease in production of gold and the lower average gold price during the latter part of the period.

**Figure 15 - Gold: The value of closing stock for South Africa at current prices: 1980-2000 (R million)**



Source: Calculations done by Stats SA

**Table 12 - Total mining and quarrying: Resource rent and other calculations for South Africa at current prices: 1980-2000 (R million)**

<b>Year</b>	<b>1980</b>	<b>1981</b>	<b>1982</b>	<b>1983</b>	<b>1984</b>	<b>1985</b>	<b>1986</b>	<b>1987</b>	<b>1988</b>
<b>Output (sales)</b>	16 160	15 072	15 851	17 872	21 871	29 754	34 250	33 902	41 127
<b>Intermediate consumption</b>	2 810	3 380	4 066	4 409	4 924	6 371	7 095	8 180	9 584
<b>Compensation of employees (total)</b>	2 618	3 254	3 617	3 991	4 624	5 439	6 467	7 783	8 894
<b>Compensation of employees (male)</b>	2 572	3 193	3 541	3 905	4 521	5 317	6 320	7 600	8 680
<b>Compensation of employees (female)</b>	46	61	76	86	103	122	147	183	214
<b>Consumption of capital</b>	786	976	1 206	1 433	1 639	2 021	2 423	2 803	3 374
<b>Opportunity cost of capital (SDR 3%)</b>	354	439	543	645	738	909	1 090	1 261	1 519
<b>Opportunity cost of capital (SDR 5%)</b>	589	732	905	1075	1229	1 516	1 817	2 102	2 531
<b>Rent (SDR 3%)</b>	9 593	7 023	6 419	7 394	9 946	15 013	17 175	13 875	17 756
<b>Rent (SDR 5%)</b>	9 357	6 730	6 057	6 964	9 455	14 407	16 448	13 034	16 744

**Table 12 - Total mining and quarrying: Resource rent and other calculations for South Africa at current prices: 1980-2000  
(R million)(continue)**

<b>Year</b>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>
<b>Output (sales)</b>	47 337	46 599	48 477	47 367	52 397	57 831	65 111	76 069	83 131
<b>Intermediate consumption</b>	10 286	11 339	12 472	13 039	13 889	15 938	16 963	18 500	20 176
<b>Compensation of employees (total)</b>	10 267	11 820	12 620	12 656	12 827	13 641	15 485	16 885	18 644
<b>Compensation of employees (male)</b>	10 013	11 504	12 271	12 317	12 496	13 277	15 045	16 383	18 096
<b>Compensation of employees (female)</b>	254	316	349	339	331	364	440	502	548
<b>Consumption of capital</b>	4 068	4 708	5 285	5 708	6 025	6 418	6 861	7 271	7 764
<b>Opportunity cost of capital (SDR 3%)</b>	1 830	2 119	2 378	2 569	2 711	2 888	3 087	3 272	3 494
<b>Opportunity cost of capital (SDR 5%)</b>	3 051	3 531	3 964	4 281	4 519	4 814	5 146	5 453	5 823
<b>Rent (SDR 3%)</b>	16 613	15 721	13 395	16 945	18 945	22 715	30 168	33 053	35 697
<b>Rent (SDR 5%)</b>	19 655	15 201	14 136	11 683	15 137	17 020	20 657	27 987	30 724

**Table 12 - Total mining and quarrying: Resource rent and other calculations for South Africa at current prices: 1980-2000 (R million)(concluded)**

<b>Year</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>
<b>Output (sales)</b>	88797	94 772	120 986
<b>Intermediate consumption</b>	22 004	23 998	26 172
<b>Compensation of employees (total)</b>	19 240	20 063	22 089
<b>Compensation of employees (male)</b>	18 657	19 447	21 362
<b>Compensation of employees (female)</b>	583	616	727
<b>Consumption of capital</b>	8 177	8 626	9 230
<b>Opportunity cost of capital (SDR 3%)</b>	3 680	3 882	4 154
<b>Opportunity cost of capital (SDR 5%)</b>	6 133	6 469	6 923
<b>Rent (SDR 3%)</b>	35 697	38 204	59 341
<b>Rent (SDR 5%)</b>	33 244	35 616	56 572

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

**Table 13. - Gold: Monetary accounts for South Africa in at current prices: 1980-2000 (R million)**

Year	Opening stock	Depletion	Revaluation	Discoveries	Other volume changes	Nominal holdings gains	Closing stock
1980	208 111	6 913	-	-	-	-	201 198
1981	129 681	4 293	-	-	-	-	125 388
1982	106 299	3 544	-	-	-	-	102 755
1983	124 143	4 186	-	-	-	-	119 956
1984	137 095	4 650	-	-	-	-	132 446
1985	201 720	6 846	-	-	-	-	194 874
1986	220 159	7 390	-	-	-	-	212 769
1987	175 490	5 816	-	-	-	-	169 675
1988	191 101	6 409	-	-	-	-	184 692
1989	145 693	4 878	-	-	-	-	140 815
1990	87 538	2 940	-	-	-	-	84 597
1991	65 882	2 218	-	-	-	-	63 664
1992	51 729	1 761	-	-	-	-	49 968
1993	131 522	4 516	-	-	-	-	127 006
1994	139 083	4 699	-	-	-	-	134 384
1995	53 660	1 766	-	-	-	-	51 893
1996	102 835	3 352	-	-	-	-	99 484
1997	34 929	1 138	-	-	-	-	33 791
1998	29 043	936	-	-	-	-	28 102
1999	36 640	1 176	-	-	-	-	35 646
2000	4 302	137	-	-	-	-	4 165

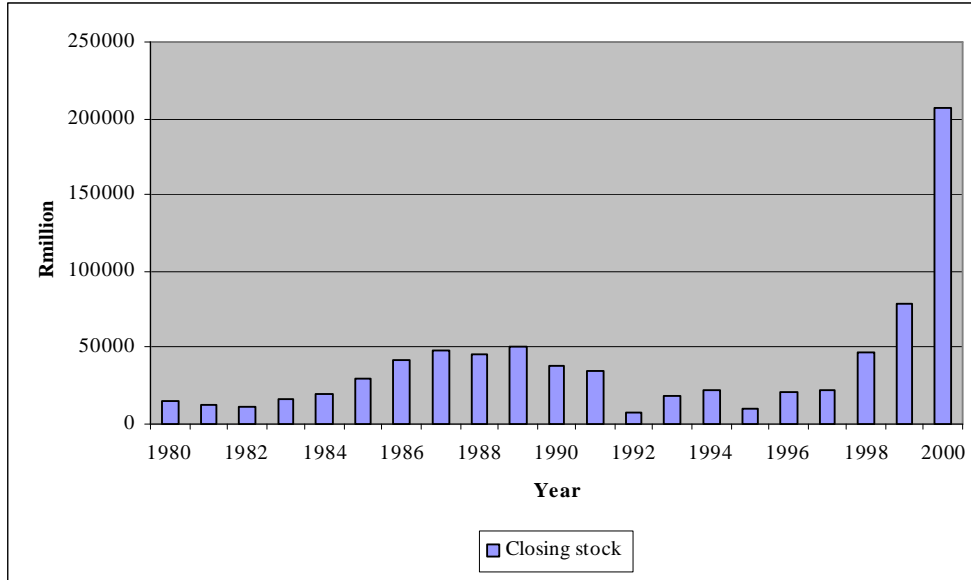
“-“ : Data not available

Source: Calculations done by Stats SA

## 7.2 Platinum

Table 14 (p. 54) and figure 16 (p. 53) show the monetary accounts for platinum in South Africa for the period 1980 to 2000. The value of the country's platinum reserves is steadily appreciating over the period from R 15 233 million in 1980 to R 206 407 million in 2000. This can be largely contributed to an increase in production of platinum and the surge in the average platinum price during the latter part of the period.

**Figure 16 - Platinum: The value of closing stock in South Africa at current prices: 1980-2000 (R million)**



Source: Calculations done by Stats SA



**Table 14 - Platinum: Monetary accounts for South Africa at current prices: 1980-2000 (R million)**

Year	Opening stock	Depletion	Revaluation	Discoveries	Other volume changes	Nominal holdings gains	Closing Stock
1980	15 690	457	-	-	-	-	15 233
1981	12 978	378	-	-	-	-	12 600
1982	10 952	319	-	-	-	-	10 633
1983	16 240	473	-	-	-	-	15 767
1984	20 257	590	-	-	-	-	19 667
1985	30 522	889	-	-	-	-	29 633
1986	43 535	1 268	-	-	-	-	42 267
1987	49 852	1 452	-	-	-	-	48 400
1988	46 522	1 355	-	-	-	-	45 167
1989	52 255	1 522	-	-	-	-	50 733
1990	38 934	1 134	-	-	-	-	37 800
1991	35 636	1 030	-	-	-	-	34 333
1992	7 244	211	-	-	-	-	7 033
1993	18 780	547	-	-	-	-	18 233
1994	22 797	664	-	-	-	-	22 133
1995	10 437	304	-	-	-	-	10 133
1996	22 110	644	-	-	-	-	21 466
1997	22 899	667	-	-	-	-	22 232
1998	48 646	1 417	-	-	-	-	47 229
1999	80 634	2 349	-	-	-	-	78 285
2000	212 600	6 193	-	-	-	-	206 407

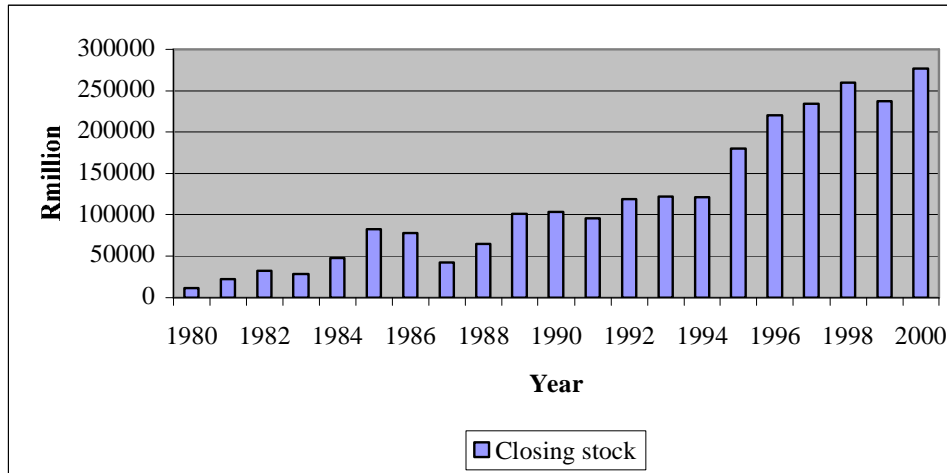
“-“ : Data not available

Source: Calculations done by Stats SA

### 7.3 Coal

Table 15 (p. 56) and figure 17 (p. 55) show the monetary accounts for coal in South Africa for the period 1980 to 2000 using the official published data as received from the Department of Minerals And Energy. The value of the country's coal reserves is steadily appreciating over the period from R 11 733 million in 1980 to R 276 439 million in 2000. This indicates net positive change (gains) in national wealth and welfare over the period.

**Figure 17 - Coal: The value of closing stock for South Africa at current prices: 1980-2000 (R million)**



Source: Calculations done by Stats SA

**Table 15. Coal: Monetary accounts for South Africa at current prices: 1980-2000 (R million)**

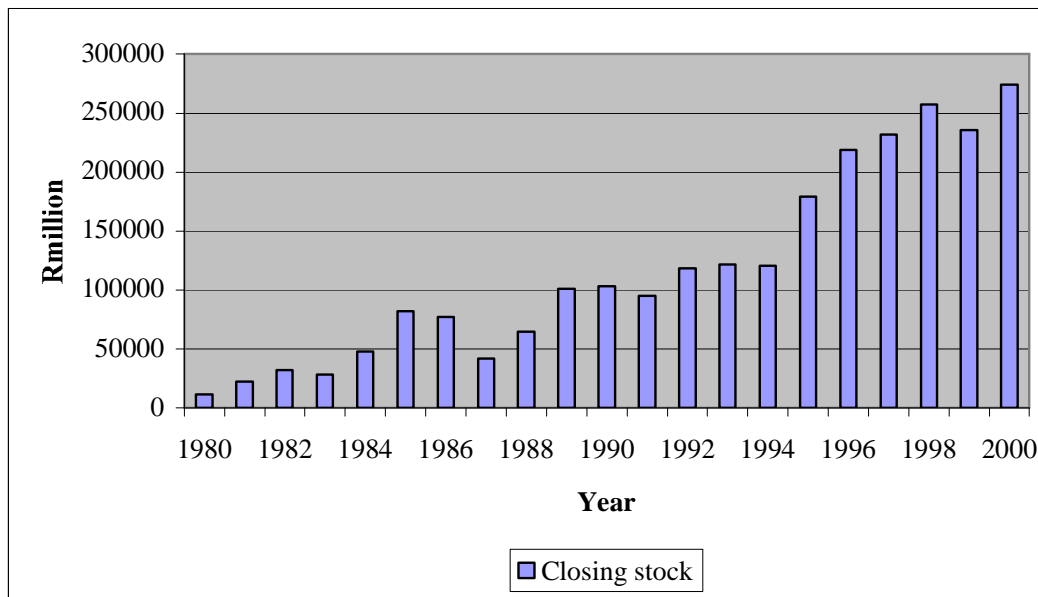
Year	Opening stock	Depletion	Revaluation	Discoveries	Other volume changes	Nominal holdings gains	Closing Stock
1980	12 085	352	-	-	-	-	11 733
1981	23 175	675	-	-	-	-	22 500
1982	33 131	965	-	-	-	-	32 166
1983	29 183	850	-	-	-	-	28 333
1984	49 576	1 444	-	-	-	-	48 132
1985	84 730	2 468	-	-	-	-	82 262
1986	80 129	2 334	-	-	-	-	77 795
1987	43 292	1 261	-	-	-	-	42 031
1988	66 532	1 938	-	-	-	-	64 594
1989	104 229	3 036	-	-	-	-	101 193
1990	106 427	3 100	-	-	-	-	103 327
1991	98 357	3 865	-	-	-	-	95 492
1992	122 355	3 564	-	-	-	-	118 791
1993	125 818	3 665	-	-	-	-	122 153
1994	124 674	3 632	-	-	-	-	121 042
1995	185 276	5 398	-	-	-	-	179 878
1996	226 531	6 600	-	-	-	-	219 931
1997	240 687	7 014	-	-	-	-	233 673
1998	266 910	7 779	-	-	-	-	259 131
1999	244 400	7 123	-	-	-	-	237 277
2000	284 738	8 299	-	-	-	-	276 439

“-“ : Data not available

Source: Calculations done by Stats SA

Table 16 (p. 58) and figure 18 (p. 57) show the monetary accounts for coal in South Africa for the period 1980 to 2000 using the unpublished data on coal reserves as received from the Department of Minerals And Energy. The value of the country's coal reserves is steadily appreciating over the period from R 11 733 million in 1980 to R 274 133 million in 2000. This indicates net positive change (gains) in national wealth and welfare over the period.

**Figure 18 - Coal: The value of closing stock for South Africa at current prices: 1980-2000 (R million)**



Source: Calculations done by Stats SA

**Table 16 - Coal: Monetary accounts for South Africa in at current prices: 1980-2000 (R million)**

Year	Opening stock	Depletion	Revaluation	Discoveries	Other volume changes	Nominal holdings gains	Closing Stock
1980	12 085	352	-	-	-	-	11 733
1981	23 172	675	-	-	-	-	22 497
1982	33 122	965	-	-	-	-	32 157
1983	29 173	850	-	-	-	-	28 323
1984	49 535	1 444	-	-	-	-	48 091
1985	84 610	2 468	-	-	-	-	82 142
1986	80 009	2 334	-	-	-	-	77 675
1987	43 226	1 261	-	-	-	-	41 965
1988	66 406	1 938	-	-	-	-	64 468
1989	104 051	3 036	-	-	-	-	101 015
1990	106 258	3 100	-	-	-	-	103 158
1991	98 175	2 865	-	-	-	-	95 310
1992	122 130	3 564	-	-	-	-	118 566
1993	125 523	3 665	-	-	-	-	121 858
1994	124 236	3 632	-	-	-	-	120 604
1995	184 426	5 398	-	-	-	-	179 028
1996	225 477	6 600	-	-	-	-	218 877
1997	239 080	7 014	-	-	-	-	232 066
1998	264 888	7 779	-	-	-	-	257 109
1999	242 516	7 123	-	-	-	-	235 393
2000	282 432	8 299	-	-	-	-	274 133

“-“ : Data not available

Source: Calculations done by Stats SA.

Table 17 (p. 60) show the comparison between the two coal monetary accounts, for the published and the unpublished data received from the Department of Minerals and Energy. From table 17 (p. 60) it is clear that the two data sets doesn't differ that much in their outcome of monetary values.

**Table 17 - Comparison of results from the two coal monetary accounts: 1980-2000**

<b>Year</b>	<b>Opening stock (SAMI)</b>	<b>Opening stock (unpublished data)</b>	<b>Depletion (SAMI)</b>	<b>Depletion (unpublished data)</b>	<b>Closing stock (SAMI)</b>	<b>Closing stock (unpublished data)</b>
<b>1980</b>	12 085	12 085	352	352	11 733	11 733
<b>1981</b>	23 175	23 172	675	675	22 500	22 497
<b>1982</b>	33 131	33 122	965	965	32 166	32 157
<b>1983</b>	29 183	29 173	850	850	28 333	28 323
<b>1984</b>	49 576	49 535	1 444	1 444	48 132	48 091
<b>1985</b>	84 730	84 610	2 468	2 468	82 262	82 142
<b>1986</b>	80 129	80 009	2 334	2 334	77 795	77 675
<b>1987</b>	43 292	43 226	1 261	1 261	42 031	41 965
<b>1988</b>	66 532	66 406	1 938	1 938	64 594	64 468
<b>1989</b>	104 229	104 051	3 036	3 036	101 193	101 015
<b>1990</b>	106 427	106 258	3 100	3 100	103 327	103 158
<b>1991</b>	98 357	98 175	3 865	2 865	95 492	95 310
<b>1992</b>	122 355	122 130	3 564	3 564	118 791	118 566
<b>1993</b>	125 818	125 523	3 665	3 665	122 153	121 858
<b>1994</b>	124 674	124 236	3 632	3 632	121 042	120 604
<b>1995</b>	185 276	184 426	5 398	5 398	179 878	179 028
<b>1996</b>	226 531	225 477	6 600	6 600	219 931	218 877
<b>1997</b>	240 687	239 080	7 014	7 014	233 673	232 066
<b>1998</b>	266 910	264 888	7 779	7 779	259 131	257 109
<b>1999</b>	244 400	242 516	7 123	7 123	237 277	235 393
<b>2000</b>	284 738	282 432	8 299	8 299	276 439	274 133

Source: Calculations done by Stats SA

## 8. Glossary

<b>Account</b>	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.
<b>Compensation of employees</b>	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
<b>Consumption of capital</b>	<p>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</p> <p>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.</p>
<b>Depletion</b>	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.
<b>Fixed assets or inventories</b>	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.



<b>Intermediate consumption</b>	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.
<b>Mineral exploration</b>	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 aerial and other surveys, transportation costs, etc, incurred to make it possible to carry out the tests.
<b>Natural Resource Accounting</b>	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.
<b>Natural Resources</b>	Natural assets (raw materials) occurring in nature that can be used for economic production or consumption.
<b>Non-renewable Natural Resource</b>	Exhaustible natural resources such as mineral resources that cannot be regenerated after exploitation.
<b>Nominal holding gains</b>	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 themselves remain qualitatively and quantitatively unchanged during the period over which the holding gain is measured.

<b>Opportunity cost</b>	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.
<b>Proved reserves</b>	Such estimated quantities of mineral deposits, at a specific date, as analysis of geologic engineering data demonstrates with reasonable certainty to be recoverable in the future under the same economic and operational conditions.
<b>Physical Accounting</b>	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.
<b>Rent/Royalties</b>	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.
<b>Revaluation</b>	Revaluation is the positive or negative holding gain accrued during the accounting period to the owners of financial or non-financial assets and liabilities.
<b>Satellite Accounts</b>	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.
<b>Stocks</b>	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 (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** 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** 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.

## Abbreviations and symbols used

ISIC	International Standard Industrial Classification of all economic activities
kg	kilogram
R/kg	Rand per kilogram
mt	Million ton
Na	Not available
NRA	Natural Resource Accounts (Accounting)
SAMI	South Africa's Mineral Industry
SEEA	System of Integrated Environmental and Economic Accounting
1993 SNA	1993 System of National Accounts
Stats SA	Statistics South Africa
SU-tables	Supply and use tables

## ANNEXURE A

### Consumption of fixed capital and capital stock for coal and gold in South Africa at replacement cost: 1910-1945 (R million)

Year	Consumption of fixed capital at replacement cost (R million)	Capital stock at replacement cost (R million)	Consumption of fixed capital at replacement cost (R million)	Capital stock at replacement cost (R million)
	Coal	Coal	Gold	Gold
1910	0,0067	0,1933	6,2	111,6
1911	0,0133	0,3782	6,2	105,5
1912	0,0165	0,4580	6,2	100,7
1913	0,0248	0,6790	6,9	105,7
1914	0,0315	0,8475	6,9	100,0
1915	0,0421	1,1133	7,8	105,5
1916	0,0549	1,4200	9,0	113,4
1917	0,0780	1,9819	11,1	131,6
1918	0,1034	2,5826	12,5	143,0
1919	0,1090	2,6482	11,8	134,3
1920	0,1288	3,0565	12,6	133,9
1921	0,1294	3,0666	10,7	105,1
1922	0,1178	2,7377	8,9	81,1
1923	0,1184	2,6780	8,2	69,7
1924	0,1226	2,7007	7,7	62,4
1925	0,1234	2,6211	6,5	56,1
1926	0,1224	2,5057	5,9	50,9
1927	0,1290	2,5767	5,8	50,4
1928	0,1329	2,5870	5,4	44,1
1929	0,1352	2,5324	4,7	41,8
1930	0,1408	2,5723	4,7	40,4
1931	0,1411	2,5135	4,4	35,9
1932	0,1354	2,3172	3,3	33,4
1933	0,1410	2,3159	3,6	45,1
1934	0,1465	2,3499	4,9	91,2

**Consumption of fixed capital and capital stock for coal and gold in South Africa at replacement cost: 1910-1945 (R million)  
(concluded)**

1935	0,1594	2,4901	6,4	134,6
1936	0,1688	2,6606	7,5	162,1
1937	0,1887	2,9271	9,2	202,3
1938	0,2061	3,1363	9,8	213,2
1939	0,2161	3,2202	9,3	211,2
1940	0,2426	3,6679	10,2	226,8
1941	0,2615	3,9534	11,3	244,0
1942	0,2883	4,3068	12,2	255,1
1943	0,3000	4,4514	12,8	256,8
1944	0,3050	4,5422	13,0	250,4
1945	0,3114	4,7308	14,4	279,0

Source: Basic Data, SARB.

## ANNEXURE B

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: 1946-2000 (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
1946	27	0,33	16	11	410	5	321	83
1947	37	0,39	23	14	561	6	470	85
1948	40	0,43	24	15	599	7	493	99
1949	44	0,50	28	15	653	9	565	79
1950	48	0,60	31	16	718	11	623	84
1951	52	0,72	37	15	786	14	709	63
1952	59	0,83	41	17	889	16	762	111
1953	64	0,83	42	22	965	16	744	205
1954	65	0,85	43	21	969	17	744	208
1955	68	0,90	45	23	1 025	17	763	245
1956	66	0,93	46	20	997	18	752	227
1957	69	0,94	44	24	1 042	18	693	331
1958	73	1,03	48	24	1 091	19	716	355
1959	76	1,09	51	24	1 136	20	763	352
1960	80	1,23	54	25	1 202	26	780	398
1961	84	1,33	55	28	1 262	25	758	478
1962	90	1,44	56	33	1 357	27	747	582
1963	92	1,61	58	32	1 383	30	753	600
1964	99	1,80	56	41	1 478	34	737	707
1965	103	2,07	56	46	1 552	40	761	751
1966	109	2,24	54	52	1 631	44	770	817
1967	112	2,50	54	55	1 675	49	803	823
1968	114	2,75	56	55	1 706	54	824	829
1969	119	3,17	60	56	1 786	63	877	846
1970	129	3,71	66	59	1 928	75	931	921

**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: 1946-2000 (R million)**

1971	138	4,36	71	62	2 065	89	993	983
1972	154	5,34	82	67	2 313	110	1 114	1 089
1973	176	6,69	93	76	2 635	139	1 236	1 260
1974	213	9,12	115	89	3 199	194	1 520	1 484
1975	288	13,49	145	130	4 325	295	2 010	2 020
1976	370	18,43	169	182	5 543	413	2 504	2 626
1977	433	24,87	183	226	6 502	569	3 066	2 868
1978	502	33,44	211	258	7 533	780	3 604	3 148
1979	627	43,05	253	330	9 401	999	4 596	3 807
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	35 112	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	26 097	66 736	42 624

Source: Basic Data, SARB.



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