# CHAPTER 11

# MINERAL DEVELOPMENT

## INTRODUCTION

11.1 During NDP 8, the mining sector continued to make a significant contribution to the economy of Botswana. The sector contributed about a third of the Gross Domestic Product, over 70% of export earnings and over 55% of total government revenues (Table 11.1 and 11.2). Developments in this sector have been dominated by the diamonds sub-sector with major projects to increase production at Orapa and Jwaneng mines.

11.2 Despite increases in production capacities, employment in the mining sector remained largely unchanged. This is because of the highly capital intensive nature of mining and the introduction of new technologies which improved labour productivity. Some sectors of the economy continue to benefit from the skills base developed by this sector. For example, artisans and other professionals trained by the mining sector have joined other sectors of the economy.

### Institutional Framework

11.3 The Ministry of Minerals, Energy and Water Resources (MMEWR) is responsible for developing and implementing the fiscal, legal and policy framework for mineral exploration, mining and mineral processing. MMEWR also administers various mineral agreements, carries out mineral investment promotion activities and liases with bilateral and multilateral development partners on mineral related matters.

11.4 MMEWR is responsible for gathering, assessing and disseminating data related to rocks, mineral deposits and ground water resources of the country. It also conducts geo-technical and environmental studies in order to provide information and advice to Government Departments and the public so as to minimise the environmental impact due to human activity and infrastructure development. The Ministry is also responsible for administration of the Mines and Minerals Act. It undertakes systematic surveys in order to encourage resources exploration and exploitation. MMEWR carries out these responsibilities through the Departments of Geological Survey (DGS) and Mines (DoM) and the Mineral Affairs Division.

11.5 While MMEWR exercises a monitoring and facilitating role, private companies undertake most of the prospecting and mining activity. The Government has significant share holding in all of the large mining companies wherein the level of share holding has been mutually agreed with the private investor. Government is not usually a shareholder in the smaller mining operations, although the institutional arrangements for small mines are otherwise the same as for large mines.

## Known Mineral Resources

11.6 Botswana has four diamond mines, two copper-nickel mines and a smelter, a coal mine, a soda ash and salt extraction plant, and a number of smaller operations mining gold, industrial minerals, and semi-precious stones. Development of a fourth though smaller diamond mine is ongoing at Damtshaa about 15km east of Orapa. The mine started production in December 2002 with output of 7,084 carats. The capacity planned for 2003 is 250,050 carats which is around the peak capacity for a few years before production declines. In

addition, the large build-up of private sector exploration activity has created a momentum, which may result in the discovery and exploitation of new mineral deposits.

11.7 A large number of other minerals are known to occur in Botswana. Those identified so far include: Agates, Fluorite, Kyanite, Silver, Antimony, Glass Sand, Lead, altered Serpentinite, Asbestos, Graphite, Limestone, Talc, Gypsum, Manganese, Uranium, Chromite, Iron, Platinum, Zinc, Feldspar and Kaolin.

11.8 Commercial exploitation of some of the above minerals has been constrained by a number of factors, such as insufficient reserves, unfavourable metallurgical properties and remote locations where there is no infrastructure to support the mining of such reserves. Developments are in some cases constrained by the weak and often volatile markets for some of these minerals. Asbestos, talc, kyanite and manganese have been exploited in the past, but are no longer in commercial production.

11.9 Although the geology of eastern Botswana is well mapped, the rest of the country, which is covered by Kalahari sands, remains largely unknown. With the development of new exploration techniques, there has been growing interest by the private sector to explore the mineral potential of these areas.

11.10 The Department of Geological Survey continues to carry out basic research and exploration to provide geological information in those areas that are not attractive and are considered too risky by the private sector. Added to the need for primordial geological information for exploration, other niche areas that require geological information continue to develop and are being identified. These include geological information for environmental monitoring and amelioration of past land-use practices. There is also an increasing need for geological information in land use planning/zoning, resources conservation and protection.

**Diamonds**

11.11 Diamonds exploration in Botswana began in 1955. Since then more than 100 kimberlite pipes have been discovered, the majority of which are non-diamond bearing. The Orapa pipe was discovered in 1967 and measures 112 hectares, making it one of the largest known diamond bearing kimberlite pipes in the world. Production at Orapa has expanded from about 2.5 million carats when the mine started in 1971 to about 12 million carats per year in 2001. The Letlhakane mine, situated some 30-km south-east of Orapa, began production in 1977 and produced one million carats in 2001. The third mine, at Jwaneng, located 125 km west of Gaborone, began production in 1982. To date, Jwaneng also has capacity to produce about 12 million carats per annum.

11.12 It is estimated that the reserves and the installed capacities at the existing mines will allow NDP 8 levels of production to be maintained during NDP 9. Prospecting for minerals is continuing throughout the country with the largest number of prospecting licences being for diamonds.

**Copper-Nickel**

11.13 The BCL mines at Selebi-Phikwe extract ore containing copper, nickel and small amounts of cobalt from two ore bodies. The Selebi orebody was discovered in 1963, and the Phikwe orebody a few years later. After mining, ore is crushed and processed in a concentrator and smelter to produce matte (a high metal content product) for refining in Norway and Zimbabwe. The existing known ore reserves at BCL are expected to sustain the current production levels up to 2010; but there is an ever-

present risk of prolonged depression in metal markets which can affect long-term plans.

11.14 Tati Nickel Mining Company has been mining copper-nickel orebodies at Selkirk and Phoenix since 1989 and 1995, respectively, with all concentrate from these mines toll-smelted (i.e., smelted at a fee) at BCL's smelting facilities at Selebi-Phikwe. While Selkirk ore was depleted at the end of NDP 8, construction of a concentrator to expand production at Phoenix from some 1.7 to 3.2 million tonnes of concentrate per year was completed during 2002.

11.15 Mineral occurrences containing copper, nickel and other metals are also known to exist at Matsitama and Bushman. The Ghanzi/Chobe fold belt has been actively explored by the private sector and copper deposits have been discovered at Ngwako Pan, some 25 km south of Lake Ngami. Exploration in some parts of the Ngwako Pan area has revealed some high-grade zones of copper-silver mineralisation. These occurrences bear geological similarities to those of the copper belt running through Zambia and Zaire where copper grades of around 6 percent are common as compared with less than 1 percent at Selebi-Phikwe and about 2 percent at Selkirk).

**Coal**

11.16 It has been estimated that there are at least 17 billion tonnes of coal reserves suitable for power plant use in eastern Botswana. At the end of NDP 8, coal was being mined only at Morupule for use within Botswana. Morupule Colliery commenced production in 1973 and has installed capacity to produce one million tonnes per annum. The demand for coal has however, restricted annual production to below a million tonnes.

**Soda Ash**

11.17 The Sua Pan, from which Botswana Ash (Pty) produces salt and soda ash, covers roughly 3 500 square kilometres and contains an estimated brine resource of 16 billion cubic metres. Botswana Ash (Pty) has overcome most of the difficulties it experienced at the beginning of NDP 8 and production has been running smoothly for the remainder of the plan period.

## REVIEW OF MINERAL SECTOR PERFORMANCE DURING NDP 8

**Exploration**

11.18 Mineral exploration activities that were registered as increasing towards the end of NDP 7 were maintained during NDP 8. The exploration of diamonds by the private sector continued to be the most important as shown in Table 11.3.

**Table 11.1: Contribution of Minerals to Government Revenue (Pula Million)**

| Year | Total Government Revenue | Mineral Revenue | Mineral Revenue as a % of Total Revenue |
|---|---|---|---|
| 1997/98 | 8,281.26 | 4,681.13 | 56.53 |
| 1998/99 | 7,677.62 | 3,186.60 | 41.51 |
| 1999/00 | 11,963.09 | 6,687.27 | 55.90 |
| 2000/01 | 14,115.05 | 8,367.80 | 59.28 |
| 2001/02 Revised | 12,639.09 | 6,878.96 | 54.43 |
| 2002/03(Budget) | 15,411.35 | 8,491.95 | 55.10 |

**Source: Ministry of Finance and Development Planning – Annual Economic Report 2002**

**Table 11.2: Contribution of Minerals to Exports (P 000, Fob)**

| Year | Total Exports | Mineral Exports | Mineral Exports as a % of Total Exports | Diamond exports as a % of Mineral Exports |
|---|---|---|---|---|
| 1997 | 10,390,700 | 8,260,422 | 79.50 | 92.85 |
| 1998 | 8,693,336 | 6,570,901 | 75.59 | 91.93 |
| 1999 | 12,227,518 | 10,370,924 | 84.82 | 93.59 |
| 2000 | 13,834,682 | 12,312,038 | 88.99 | 92.46 |
| 2001* | 4,063,159 | 3,713,976 | 91.41 | 94.73 |

(* 1st quarter)

**Source: Ministry of Finance and Development Planning – Annual Economic Report 2002**

**Table 11.3. Number of prospecting mineral concession per mineral group during NDP 8.**

| Year/ Mineral | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|
| Diamonds | 338 | 530 | 495 | 556 | 464 |
| Various Minerals | 233 | 313 | 215 | 132 | 126 |
| Sand and gravel | 0 | 0 | 0 | 0 | 106 |

**Source: Department of Geological Survey**

11.19 Exploration for industrial minerals, precious metals, and energy minerals continued to be subdued. However, there was an increase in the extraction of construction and building materials in areas around the major villages and urban centres resulting in the deterioration of the environs around these resources. Difficulties were encountered in implementing the regulatory measures to control the exploitation of construction/building materials in a manner that safeguards the environment. Co-ordination between various licensing authorities was identified as a major weakness, which contributed to environmental degradation.

11.20 During NDP 8, the program of gathering basic geological information for use in both land-use planning and mineral investment promotion continued with the mapping, geo-chemical and geo-physical surveys in various parts of the country. An aeromagnetic survey of the north western Ngamiland was completed and its results led to the private sector taking an interest in the area. Eighteen (18) kimberlite pipes, though barren, were subsequently discovered. The aeromagnetic data also proved invaluable in selecting drilling sites for the Ngamiland TGLP groundwater project.

11.21 Other NDP 8 completed aeromagnetic surveys are Central Kalahari, Limpopo Central Zone and Francistown Complex. Data from these surveys is continually accessed for use and additional interpretation by the private sector and researchers. Acquisition and processing of gravity data from northern Botswana has also been completed. As planned, a network of 10 seismic stations to monitor earthquake activity in northern Botswana was set up and monitoring will continue into NDP 9. Data are now being collected at these stations.

11.22 The north-west Ngamiland base line geochemical mapping project was completed during NDP 8 and data from this project were being packaged for end users by the end of the plan period. The mapping project provided base line

mineral element concentrations in the soils of the Ngamiland District. Some of the high element concentrations are coincident with the geophysical anomalies defined from the aeromagnetic data over the same area. These need to be investigated further during NDP 9.

11.23 The only notable mineral discovery during NDP 8 is the Mupani gold prospect within the Tati Schist relic east of Francistown. Several kimberlite pipes, most of which were barren of diamonds were discovered in Ngamiland, Kweneng, Kgalagadi, Kgatleng and Southern districts. Coal bed methane has been reported in the Lephephe and Mmashoro coal deposits. To this end, work on defining the extent of coal bed methane is continuing.

**Mineral Production**

11.24 More than P2.0 billion was invested in the mining industry during the period under review. Much of this capital investment was for either capacity expansion or provision of access to new reserves. The major investment during the period was expansion of production at Orapa, construction of the Aquarium project (a diamond recovery and sorting process) at Jwaneng, the construction of a concentrator and expansion of production at Phoenix mine.

**Table 11. 4: Botswana's Mineral production, 1997-2001**

| Year | Diamonds Carats (1000) | Copper/ Nickel Metal in Matte Tonnes (1000) | Coal Tonnes (1000) | Soda Ash Tonnes (1000) | Salt Tonnes (1000) | Gold (Kg) | Crushed stone ($M^3$) (1000) |
|---|---|---|---|---|---|---|---|
| 1997 | 20,111 | 40 | 777 | 200 | 185 | 28 | 1,092 |
| 1998 | 19,687 | 45 | 928 | 196 | 199 | 1 | 997 |
| 1999 | 21,263 | 60 | 945 | 234 | 233 | 8 | 1,466 |
| 2000 | 24,635 | 48 | 947 | 191 | 185 | 4 | 1,070 |
| 2001 | 26,190 | 51 | 930 | 251 | 179 | 2 | 2,141 |

**Source: Department of Mines**

**Diamonds**

11.25 During NDP 8, Debswana continued to mine diamonds at all its existing mines (Orapa, Letlhakane and Jwaneng). A new small diamond mine (Damtshaa) was opened near Orapa. The Tswapong Mining Company trial diamond mine near Lerala village closed down operations in 2001 following completion of the feasibility study, which indicated that the project was not viable. Diamond production during NDP 8 averaged above 20 million carats per annum compared with 16 million carats per annum during NDP 7 (Table 11.4).

11.26 During NDP 8, notable developments in the diamond sub-sector were the introduction of continuous operations, the expansion of production at Orapa mine and the commissioning of improved recovery and sorting processes at Debswana mines. All these developments raised diamond production from below 18 million carats in 1996 to over 26 million carats in 2001.

11.27 Gope Exploration Company investigated and completed a feasibility study on the Gope diamond prospect located in the Central Kalahari Game Reserve. The feasibility study concluded that the prospect was uneconomic to develop at the prevailing market conditions.

11.28 At the start of NDP 8, depressed global markets and economic problems in Asian markets, created difficult trading conditions in the market for diamonds, leading to the imposition of supply restrictions in 1998. Demand for diamonds improved during 1999 and 2000 due to, among other factors, the millennium celebrations, especially in the United States of America (USA). During this period of improved market conditions, Debswana was able to sell the stockpile accumulated in 1998.

11.29 Demand for diamonds declined again during 2001 and especially following the 11 September 2001 attack in the USA, hence resulting in the re-introduction of supply restrictions. Although the major world economies are still experiencing economic difficulties, some improvements are forecast in future, in line with forecast improvements in the performance of major world economies.

11.30 In addition to pressures from weak market conditions starting 1998, the diamond industry also came under pressure from campaigns against "conflict diamonds". Botswana has, in collaboration with NGO's, diamond producing and consuming countries and the diamond industry representatives, developed a system for rough diamond certification whose implementation started on 1st January 2003. Implementation of the rough diamond certification system is intended to exclude 'conflict diamonds" from the legitimate trade in rough diamonds.

11.31 Parallel to participation in the development of the rough diamonds certification system, Botswana also embarked on a "Diamonds for Development" campaign. The "Diamonds for Development" campaign aims to present to potential diamond consumers and opinion makers in general the many positive socio-economic effects of the diamond industry in Botswana and other stable, democratic diamond producing countries. The campaign has provided coverage for Botswana's diamond success story, across all communications media, especially in Europe and North America, with the objective of counteracting the negative publicity generated by the international debate over "conflict diamonds". This campaign was continuing at the end of NDP 8 and will continue into the next plan period.

**Copper-Nickel**

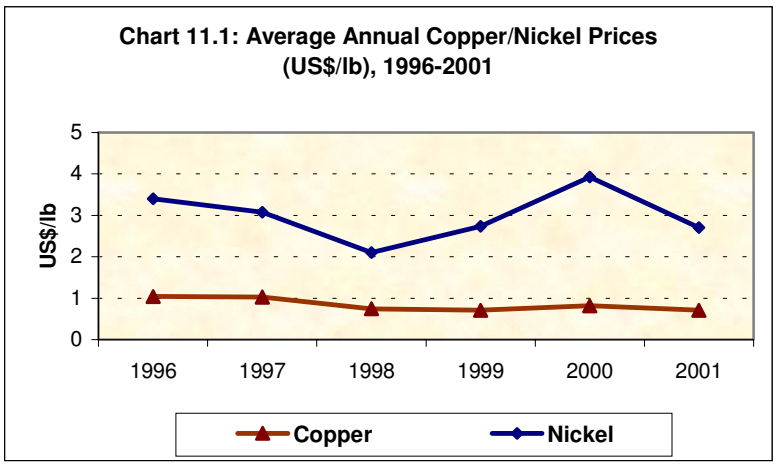
11.32 Copper-Nickel prices were relatively high during the first two years of NDP 8, followed by two years of weak metal prices (Chart 11.1). During the period when metal prices were depressed, BCL's operations experienced financial difficulties with large amounts of emergency funding advanced to ensure continued operations.

11.33 The operations at Tati Nickel Mining Company continued satisfactorily. The company undertook a major expansion at Phoenix Mine, which was completed towards the end of NDP 8.

11.34 A mining lease for the development of the Thakadu/Makala copper-silver deposit was issued during NDP 7. However, there were no developments during NDP 8 and the lease was subsequently cancelled.

**Soda Ash and Salt**

11.35 Botash's production of soda ash and salt has increased steadily from 119,000 and 94,000 tonnes of soda ash




**Source: Department of Mines**

and salt, respectively in 1996 to a high of 233,000 tonnes for salt in 1999 and 251,000 tonnes of soda ash in 2001. South Africa continues to be the main market for Botash's products, with smaller amounts of soda ash and salt sold to the northern markets, e.g. Zimbabwe and Zambia.

**Coal**

11.36 Morupule Colliery increased its annual output from about 760,000 tonnes at the beginning of NDP 8 to 930,000 tonnes during 2001. Although the Colliery has capacity to produce one million tonnes per annum, production is restricted by the demand for coal.

11.37 Anglo American Corporation sold all its interest in Morupule Colliery (Pty) Ltd, to Debswana Diamond Company in 2000. The Morupule mining licence was renewed for a further period of 25 years from 2001.

**Gold**

11.38 The slump in gold mining that started during NDP 7 continued during NDP 8, and there were no major gold mining operations that opened during NDP 8. The Somerset small gold mine owned by Joren (Pty) Ltd was the only producer of gold during NDP 8.

11.39 Gallery Gold Botswana (Pty) Ltd completed a pre-feasibility study on the Mupani gold deposit in the Francistown area. The results are encouraging and the company intends to conduct a full feasibility study, which will be completed early in NDP 9.

**Other Mining Activities**

11.40 Demand for sand, crushed stone and gravel continued to grow during NDP 8 due to increased construction activities. Crushed stone production averaged 1.5 million cubic metres per year during the period under review.

11.41 Semi-precious stones dealers activities remained almost stagnant until towards the end of NDP 8 when the number of licensed dealers increased from 2 to 5. Two operations produced semi-precious stones for both the local and export markets, while the remainder polished stones for local jewellery manufacturers.

**Air Pollution**

11.42 During the NDP 8 period ambient air quality monitoring continued to be concentrated in the Selebi-Phikwe area where Government air pollution monitoring sampling instruments measure the concentrations of pollutants from the copper/nickel smelter. Table 11.5 shows a concentration of pollutants over the country averaged over five years.

**Table 11.5. Average concentrations of selected pollutants in Botswana obtained using Continuous Gas Analyzers during 1997-2001**

| LOCATION | $SO_2$ µg/$m^3$ | CO µg/$m^3$ | NO µg/$m^3$ | $NO_2$ µg/$m^3$ | O3 µg/$m^3$ |
|---|---|---|---|---|---|
| Gaborone | | | | | |
| Civic Centre | 28 | | 30 | 60 | - |
| Fire Brigade | 34 | 1,553 | 56 | 96 | - |
| Marang | 21 | 16 | - | 12 | - |
| Lobatse | - | - | - | - | - |
| Moshupa | - | - | - | - | 70 |
| **Francistown** | | | | | |
| City Council | 7 | - | - | - | - |
| Blue Jacket | - | 29 | 15 | - | - |
| Tonota | 14 | - | - | - | - |
| Maun | - | - | - | - | 87 |
| **Selebi Phikwe** | | | | | |
| Kopano | 71 | - | - | - | - |
| WUC | 108 | - | - | - | - |
| BDF | 38 | - | - | - | - |
| Orlando | 22 | - | - | - | - |
| **Mmadinare** | 25 | 71 | - | - | - |
| Palapye | 15 | - | - | - | - |
| Serowe | 84 | 20 | 3 | - | - |
| Botswana Air Quality guidelines | 80 | 10,000 | - | 100 | 235 |

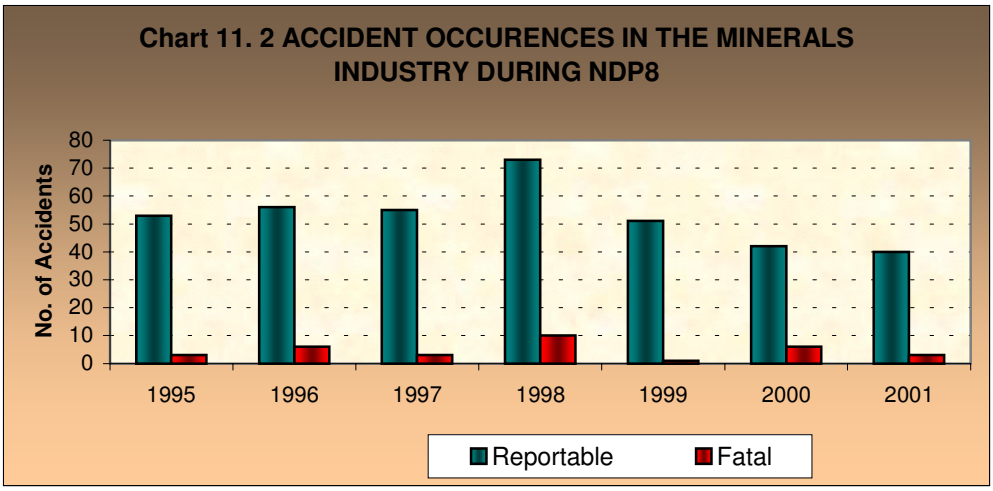
**Source: Department of Mines**

11.43 Concentrations of other pollutants such as nitrogen oxides were found to be highest (but below maximum allowable levels) in places like Gaborone where there is heavy traffic. Inspections of the major sources of air pollution in Botswana indicated that the industrial processes generally complied with the conditions of their registration certificates, except BCL mine where sulphur dioxide emissions in the immediate vicinity of the smelter complex generally exceed the ambient air quality guidelines.

**Employment**

11.44 During NDP 8, employment in the mines varied between a low of about 13,000 in 1996 and a high of about 15,000 people in 1998 (Table 11.6). The increase in employment was largely due to construction activities associated with major projects at Orapa and Jwaneng mines. Completion of major projects resulted in a decrease of employment to about 13,000 persons. Employment of expatriates in the mining industry fluctuated between 6 and 9 percent during NDP 8. The number of expatriates increased during periods of major construction projects. The number of women employed in the mines was about 1995 at the end of NDP 8.

11.45 Chart 11.2 and Table 11.6 reflects accident occurrences during NDP 8 period in the minerals industry.




**Source: Department of Mines**

**Table 11.6: Employment in the Minerals Industry, 1997-2001**

| Year | Citizens | Expatriates | Total | Expatriates as % of Total |
|---|---|---|---|---|
| 1997 | 12,227 | 828 | 13,055 | 6.34 |
| 1998 | 13,855 | 1,400 | 15,255 | 9.18 |
| 1999 | 13,158 | 1,187 | 14,345 | 8.27 |
| 2000 | 12,173 | 788 | 12,961 | 6.08 |
| 2001 | 12,173 | 788 | 12,961 | 6.08 |

**Source: Department of Mines**

11.46 The following projects planned for NDP 8 were all undertaken;

(i) Rehabilitation of identified old mine workings in Francistown and Magogaphate.
(ii) Establishment of a Department of Mines regional office in Francistown.
(iii) Construction of a laboratory for environmental pollutants analysis.
(iv) Upgrading and expansion of air pollution monitoring stations
(v) Feasibility of a mining and mineral testing facility
(vi) Computerization of the Department's offices

11.47 All planned projects were completed except for minor components of some projects such as procurement of equipment for the environmental laboratory and computerization of Selebi-Phikwe regional office, which is carried over into NDP 9.

11.48 During NDP 8, there were significant changes in Government's mineral policy aimed at making Botswana's mineral policies more competitive and attractive to investors. A new Mines and Minerals Act which became effective on 31 December 1999 and a new mining tax were introduced. The highlights of policy changes that occurred during NDP 8 were as follows;

- the abolition of the Government's right to 15% free equity participation in new mining projects. Government now has the option to acquire up to 15% shareholding in new mining

ventures on mutually agreed commercial terms.

- restrictions on the transfer of mineral concessions have been liberalised.

- explicit environmental protection measures have been incorporated into the Act.

- the grant, renewal and transfer of licences have been made more predictable, hence improving security of tenure.

- royalty schedules have been revised, with rates reduced from 5% to 3% for all minerals except precious stones and precious metals, which remain at 10% and 5%, respectively.

- the previous policy of "use it or lose it" has been relaxed by introducing a new type of mineral concession, the "Retention Licence". This will allow a company that has completed an exploration program and confirmed the discovery of a mineral deposit, to retain rights over the deposit in the event that prevailing market conditions are such that the deposit cannot be immediately exploited economically.

- a new mining taxation system using a variable rate income tax formula has been introduced. This tax regime will apply to all mining except diamond mining, the terms of which will continue to be negotiated between the investor and the Government.

- it is now automatic to move from a Prospecting License to a Mining License with the exception of Diamond licenses.

11.49 The new mineral policy changes have only been in place since December 1999 and their impact, with regard to investments in the minerals sector, has not been notable. The introduction of the revised policy change has unfortunately coincided with a period of reduced exploration activity due to the world recession during 2000 and 2001. Botswana has also suffered from international concern about security in the region generally.

## MINERAL SECTOR POLICY AND STRATEGIES FOR NDP 9

11.50 The overall mineral policy objective of maximizing economic benefits for the nation from development of mineral resources while allowing investors to earn competitive returns will remain unchanged. NDP 9 policy objectives will focus on:

- Encouraging prospecting and new mine developments,
- Creating opportunities for generating linkages with the rest of the economy and increasing local value added,
- Conserving and protecting the environment and,
- Identifying and developing appropriate strategies for dealing with challenges facing the minerals sector.

### Encouraging prospecting and new mine developments

11.51 During NDP 9 the Ministry will continue developing mineral policies that provide for an environment conducive to attracting investments into the minerals sector. By increasing investments and the economic benefits from the exploitation of mineral resources, MMEWR will contribute towards achieving a prosperous, productive and innovative nation as envisaged by Vision 2016.

11.52 Following policy changes introduced during NDP 8, Botswana's mineral policies are now substantially consistent with best international

practices. However, during NDP 9, information technology will be used to promote and give mineral policies targeted but wide publicity. The impacts of mineral policy changes will be monitored and new policy initiatives investigated.

11.53 MMEWR has developed a strategic plan covering the period 2000-2006. Among its many objectives, the strategic plan aims at improving the efficiency of, among other things, the administration of mineral concessions. Since investors are also attracted by the efficiency and the transparency of implementing policies, capacity building in the Ministry will be given priority.

**Creating opportunities for generating linkages with the rest of the economy and increasing local value added**

11.54 A substantial level of skills that drive the minerals industry is still imported. The Ministry will continue working with other Ministries and the private sector to encourage the building of the requisite skills in the country.

11.55 MMEWR's past efforts to promote downstream processing of minerals produced in the country have not been very successful. Diamond cutting, which promised growth during NDP 7, did not perform well during NDP 8. During NDP 9, the MMEWR will continue exploring areas within the minerals sector where value adding can be achieved.

**Conserving and protecting the environment**

11.56 MMEWR recognises that increasing investments in the minerals industry will impact on the environment. The environmental protection provisions introduced during NDP 8 review of the Mines and Minerals Act will be enforced in all mineral developments. Appropriate strategies will be developed and implemented to deal with environmental challenges posed by small-scale mining operations. The objective of achieving a conserved and protected environment is linked to Vision 2016's pillar of a safe and secure nation.

**Identifying and developing strategies for dealing with challenges facing the minerals sector**.

11.57 The diamond industry changed as new and significant producers opened new mines around the world during NDP 8. Exploration in many parts of the world is ongoing with possibilities of further discoveries. Some of these new producers opted to market their production outside the single channel marketing system and this poses new challenges for Botswana's diamond industry. During NDP 9, the Ministry will, with other stakeholders, monitor the diamond market dynamics and devise appropriate strategies.

11.58 Another development that poses challenges for the diamond industry is the issue of conflict diamonds. As a result of campaigns against conflict diamonds, the diamond industry faces the threat of consumer boycotts. Consumer boycotts would have a devastating effect on diamond driven economies like Botswana.

11.59 Since May 2000, governments of diamond producing and consuming countries, NGOs and other stakeholders have jointly been working on the development of a global system for certification of rough diamonds that is aimed at excluding conflict diamonds from the legitimate diamond trade. The system, whose essential elements have been agreed, is being implemented with effect from January 2003. Despite the certification system, MMEWR recognizes the need to continuously promote the cleanliness of Botswana's

diamonds and their importance to the country's economy through the "Diamond for Development" campaign. During NDP 9, MMEWR will, in collaboration with other stakeholders, continue scanning the environment and devising appropriate strategies to protect Botswana's diamond industry.

**Exploration**

11.60 MMEWR will continue to promote the exploration for energy resources especially coal-bed methane (CBM). This shift from petroleum oil and gas is a result of disappointing results from the studies completed in the early part of the NDP 8. There are vast coal resources within the Kalahari Karoo Basins of Botswana that were never investigated for their CBM carrying potential. Studies by the private sector and government on Botswana's coals CBM potential were initiated towards the end of NDP 8. The most favourable targets for these studies will be the Central Kalahari Karoo Sub-basin covering the middle of Central Botswana.

**Productivity Improvement**

11.61 During the last years of NDP 8, MMEWR developed a Strategic Plan in order to achieve the objectives of Vision 2016. The Strategic Plan will be a guiding tool on what the ministry would like to achieve. However, most of the activities in the Strategic Plan have not been implemented, but are rather envisaged to be enforced during NDP 9. The developments in the minerals sector will be in line with the ministry's Strategic Plan, whose specific goal is to facilitate increase in the net economic benefits from mineral exploitation by effective implementation of policies and administration of licences. The key results areas and goals of the minerals sector are;

**Box 11.1 MMEWR Key Result Areas and Goals**

| ITEM | |
|---|---|
| KRA-1: Competitive Mineral Policies Availed | GOAL-1: To increase the net economic benefits from mineral exploitation by effective implementation of policies and administration of licences |
| KRA-4 : Customers And Stakeholders Satisfied | GOAL-2: To satisfy customer needs by provision of efficient and effective services in Energy, Minerals and Water Sectors |
| KRA-5: Skilled And Motivated Workforce | GOAL-3: To increase productivity by empowerment, providing appropriate training, development and recognition of staff |
| KRA-6: Ministry Efficiency Achieved | GOAL-4: To reduce time and unit cost of delivering services and products to stakeholders by developing and implementing effective management systems (Policies, Systems, Procedures and Structures) |

Source: MMEWR

**Human Resources**

11.62 With the escalating scourge of the HIV/AIDS, MMEWR will intensify its awareness campaigns to reduce the impact on its sectors. MMEWR will, in consultation with the National AIDS Co-ordinating Agency, develop and implement an HIV programme during NDP 9 in order to combat the threat of the virus at the workplace.

**Information Technology (IT)**

11.63 During NDP 8 the Departments of Mines, Geological Survey and Minerals Affairs Division installed Local Area Networks, which comprised cabling and provision of servers. At the end of the plan period under review, the Department of Geological Survey was also in the process of implementing an integrated system for the management of geological data in the department.

11.64 During NDP 9, MMEWR will develop mineral information systems to improve efficiencies in the sector. The development of the minerals information system will cover processes from exploration, through mining to marketing of minerals. Currently business processes in this area are either carried out manually or are based on a series of stand-alone applications that were developed to specifically serve a particular business need. Most of the databases in this area are in the Department of Geological Survey. To accommodate the spatial nature of some data, it will be necessary to develop some applications using geographic information system techniques in order to improve on presentation of trends. For greater information dissemination and manipulation there is need to develop an interactive web interface for the systems.

11.65 In order to make the envisaged mineral information systems a reality, MMEWR will carry out a project to develop a mineral market monitoring system, to facilitate timely decision making regarding changes or developments in the mineral industry. Emphasis will be directed to minerals with a major contribution to the economy.

11.66 MMEWR will also develop an exploration drillhole management system (EDMS) that will be used for storing, easy retrieval and display of any exploration drillhole related data. The system will act as a central repository of data from boreholes drilled by the government and private sector. The system will provide the much-needed drillhole information to a wide variety of people including geoscientists, consultants, government agencies, educational groups, and the general public.

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