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Edited by

N Leader-Williams, JA Kayera and GL Overton

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MINING IN PROTECTED AREAS IN TANZANIA

Proceedings of a Workshop held in March 1994

Edited by

N Leader-Williams, JA Kayera and GL Overton

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PREFACE

Natural resources are either renewable, for example wildlife populations, or non-renewable, including deposits of metals and minerals. These two types of resource require different management strategies and consequently, many countries, including Tanzania, have not developed a holistic *natural resources* sector. Exploitation is managed by separate ministries and different sectors, without much real exchange of ideas. Indeed, sectors may even clash over ideas or ideals, for instance, when one sector wishes to mine in a wilderness area managed by the other sector. In some cases, both sectors loose control, for example, when a headlong rush is made for a new discovery of some valuable metal such as gold. Such cases damage the resources under the control of both sectors. A common desire to prevent such situations in future has led to the production of this volume.

Tanzania is renowned internationally for its wildlife resources and its extensive network of protected areas devoted to wildlife conservation. Many believe that the wildlife sector has the potential to contribute significantly to Tanzania's economic recovery. The impressive and extensive mineral resources of the country include precious metals and gemstones, and are less well known. Despite its great potential, the mineral resources sector has declined while it was a state-controlled monopoly. Recently, most mining in Tanzania has been undertaken by a roving band of some half a million artisinal miners. Artisans mine *illegally*, in an environmentally damaging manner, and contribute little to the national economy. Over the past decade, Tanzania has encouraged development in the private sector. The mining sector in particular has developed policies leading to impressive growth.

It is not surprising that some valuable mineral resources occur within the extensive network of protected areas in Tanzania. Indeed, gold has been mined on a small scale in the past at Kilimafedha Hill, in what is now the world famous Serengeti National Park. A future gold rush in such a situation would cause a considerable law enforcement problem for wildlife authorities, and uncontrolled damage to the protected area and its wildlife. Just such a situation arose in a much less well known protected area that was soon to be designated in the Greater Ruaha ecosystem. The regional and district authorities had been processing the gazettement of Muhesi as a new Game Reserve for a number of years. However, in 1991, before the gazettement was complete, about 5000 artisinal miners moved in to dig for gold at Iluma Hill (Lamprey and Lyimo 1992). The miners used unsightly and destructive methods, and their extraction techniques released dangerous chemicals into a water catchment of national importance (Lamprey 1992). The wildlife authorities were powerless. It was impossible to arrest 5000 miners, and they had no power to do so, as the land had no formal status as a protected area. It is in the interests of both the mineral resources and wildlife sectors to prevent such a situation happening again.

This workshop was held to resolve the situation. The Planning and Assessment for Wildlife Management (PAWM) project had just begun the process of preparing a management plan for the Game Reserve complex of which Muhesi was to be a part. It was necessary to assess the situation, and obtain some idea of the size and potential of the gold deposit at Iluma Hill. Consequently, a consultant was hired to visit the site. Then the mineral resources sector was asked to suggest the best approach to the issue. Overall, this workshop produced a neat and amicable solution that is in line with the broad policy objectives of both mineral resources and wildlife sectors. The former wish to encourage the development of large and medium scale mining firms that extract minerals efficiently, with minimum environmental pollution, and with adequate returns to the national economy. The potential of the Iluma Hill deposit suggests that granting a lease to a medium scale mining firm should solve many environmental and law enforcement problems facing the Wildlife Department in managing mining in Muhesi. Furthermore, if the Department received even a modest royalty of 3%, it would

raise a sum several times larger than its present budget allocated from Treasury. Recommendations from this workshop are being incorporated into a management plan for the Rungwa-Kizigo-Muhesi GR complex. Furthermore the wider implications of mining in other protected areas have been incorporated into the Policy for Wildlife Conservation and Utilisation.

N Leader-Williams
Formerly Chief Technical Advisor, PAWM

JA Kayera
Project Manager, PAWM

References

Lamprey, RH (1992). *A report on gold mining activities and agricultural encroachment along the Kizigo river in Muhesi Game Reserve; implications for Mtera Dam.* Paper to National Environmental Management Council workshop on Mtera dam, August 1992.

Lyimo, MM and Lamprey, RH (1992). *A report on gold mining activities and agricultural settlement in Muhesi Game Reserve.* PAWM assessment report for the Wildlife Division.

ACKNOWLEDGEMENTS

The holding of a workshop such as this, and the task of compiling the information required can only be achieved with teamwork of a high order. PAWM would very much like to thank the Regional Commissioner for Singida for opening the workshop, and for the agreement of the Director of Wildlife and the Commissioner of Mines to hold the workshop. Our consultant worked hard to fit us and the rainy season into his schedule. All the PAWM staff worked hard with staff throughout the wildlife and mining sectors to produce a set of workable recommendations.

Our donors and project managers deserve great thanks. PAWM is funded by USAID, and managed jointly by the African Wildlife Foundation (AWF) and the Tanzania Office of World Wide Fund for Nature (WWF). The programme of work undertaken by PAWM has been impressive in its breadth and scale. Our donors and project managers are thanked for their foresight and vision in initiating and funding the programme of work undertaken by PAWM. These proceedings have already been printed and distributed locally in Tanzania, but this volume makes them available to an international audience. Our donors are thanked for agreeing to fund the international publication through the Environmental Planning Group at the International Institute for Environment and Development. The Institute of Zoology of the Zoological Society of London, and the Durrell Institute of Conservation and Ecology in the University of Kent provided a base for the senior editor to complete their production. Dr Leslie Smart very conscientiously sub-edited the proceedings, and staff of IIED took great care in their production, particularly Dr Barry Dalal-Clayton and Julian Lewis.

OPENING

RUNGWA-KIZIGO-MUHESI GAME RESERVE COMPLEX MINING WORKSHOP

Honourable AY Mgumia
Regional Commissioner, Singida Region

Mr Chairman
Distinguished Delegates

First and foremost, I would like to take this opportunity to express my sincere gratitude to the organisers for having invited me to officiate at this very important meeting. The issue of possible conflicts between development and conservation is an exceedingly important and interesting topic.

Muhesi Game Reserve has an area of 2,200 sq km and lies entirely in Manyoni District. Muhesi is endowed with various natural resources such as wildlife, vegetation, areas of scenic beauty and, not least, minerals. In addition, Muhesi is part of the 15,726 sq km Rungwa-Kizigo Complex, which is an important water catchment area for Mtera Dam.

Tanzania has set aside 25% of her land surface for wildlife conservation. It has also been established that Tanzania's is very rich in economically exploitable mineral resources. In some parts of Tanzania, areas of wildlife conservation and mineral deposits overlap, and Muhesi is such an area. Clearly, both wildlife and mineral resources have great economic value.

The custodians of these two resources, namely the Wildlife and Mineral Resources Departments, operate under different legislations and separate authorities, which may cause some complications in resource exploitation. For example, entry and any human activities are prohibited in a Game Reserve unless a signed permit is obtained from the Director of Wildlife. Equally, the Wildlife Department appears to have no mineral rights in land that it manages in Game Reserves!

This meeting has, therefore, been convened to plan for the development and utilisation of both wildlife and mineral resources in Muhesi. This will serve as a useful basis upon which to develop a policy and management plan to ensure that mineral resources and wildlife conservation both contribute to our national economy.

The Government recognises the need to involve and co-ordinate the different sectoral experts in the development of the policy and management plan for Muhesi. At this meeting, you will hear and discuss interesting views from the following experts:

- the opinions of professional staff from the Department of Mineral Resources;
- the opinions of professionals in wildlife conservation who will show the implications of mining activities within wildlife areas, and to the environment in general; and,
- the opinions of the consultant who carried out the preliminary mining study in Iluma gold mines. The consultant will present the different options that Tanzania can take in order to ensure that the mineral resources present in Iluma area can be economically exploited in a manner that is environmentally friendly and appropriate to a conservation and important water catchment area.

After the formal presentations, the meeting will discuss the issues thoroughly and formulate recommendations for the future conduct of mining and wildlife conservation in areas where the two resources occur. This will give the regional administrators a chance to discuss the importance of the mineral resources in the development of Singida Region and its people. I am sure these recommendations will assist the Departments of Wildlife and Mineral Resources in the formulation of future policies related to mining activities in protected areas.

Issues that I believe will require careful thought and deliberations include:

- regulations and conditions for undertaking mining activities in protected areas so that mining is not exceedingly destructive to the environment;
- revenue sharing mechanisms between the different authorities with a stake in the area, namely Local Government, Wildlife and Mineral Resources Departments and Treasury; and,
- the need for co-ordination and collaboration between relevant authorities.

Finally, I would like to thank the sponsors of this meeting. Conservation is an expensive undertaking requiring the assistance of donors as well as our own dedication. We are indeed grateful to USAID and the AWF and WWF for having funded and managed jointly the Planning and Assessment for Wildlife Management project. This project has the specific aim of assisting the Department of Wildlife to develop plans and policies for the wildlife sector. This meeting will enable us to have a consensus on mining issues inside the protected areas.

With these few words, may I wish you every success in your endeavours. I now formally declare the meeting open.

1: WILDLIFE LEGISLATION AS IT RELATES TO MINING IN PROTECTED AREAS

Planning and Assessment for Wildlife Management
Department of Wildlife, PO Box 63150, Dar es Salaam, Tanzania

1.1 Introduction

Tanzania has set aside 15% of its land area as National Parks and Game Reserves. The Wildlife Conservation Act, No. 12 of 1974, as amended in 1978, is the principal legislation of the Wildlife Department. This act specifies the rules and regulations for the management of Game Reserves in Tanzania, *inter alia*, that:

- no person may enter a game reserve without the written authority of the Director of Wildlife (Part III, Section 7);
- no person shall hunt, capture, kill, wound or molest any animal (including fish) in any game reserve without the written permission of the Director of Wildlife (Part III, Section 10);
- no person may cause any grass fire, or fell or cut any tree or shrub in a game reserve except with the permission of the Director of Wildlife. If any part of the game reserve is in a forest reserve, permission must also be given by the Director of Forestry or his duly authorised representative (Part III, Section 9); and,
- no person may graze livestock in a game reserve without the permission of the Director of Wildlife (Part III, Section 12).

1.2 Mining in Game Reserves: Current Legal Status

Jurisdiction of the natural resources found in protected areas does not necessarily fall to the Department of Wildlife, as The Department of Mineral Resources *Madini* considers mineral rights separate from ownership.

There is no provision in the Wildlife Conservation Act of 1974 for mining in Game Reserves. Even if prospectors and miners are licensed by *Madini* to operate in a Game Reserve, they must also obtain permission from the Director of Wildlife. In the current example of Muhesi Game Reserve, artisanal gold miners entered the Game Reserve without permission and damaged the environment by digging pits and destroying vegetation, so contravening the Wildlife Conservation Act.

1.3 Future Considerations for Mining in Game Reserves

A policy should be formulated to specify the conditions under which mining may take place in Game Reserves. The Wildlife Department has already made provisions for small-scale, carefully controlled resource acquisition in certain Game Reserves. These provisions are generally made during gazettement, or less frequently, under separate Government Notice. In Ugalla Game Reserve, for example, the Wildlife Department has given permission for beekeepers and fishermen to enter the Game Reserve each year to collect honey and catch fish. Bee-keeping may also take place in parts of Moyowosi Game Reserve.

In a similar way the Wildlife Department and relevant authorities may agree to set aside special areas for mining, whilst ensuring a minimum impact on the environment. To this end, Policy

Guidelines should be made taking into account the primary conservation purpose of the reserve, and specifying the mechanisms under which settlement and entry into the Game Reserve will be permitted. A precedent for this type of zonation within Forest Reserves has been set with the recent establishment of a gemstone mining zone (see 1.4d) through consultation between the Forestry Division and *Madini*.

1.4 Mining in Other Protected Areas

The principal legislation for other types of protected area is described below.

(a) National Parks Ordinance CAP 253 (1948) and CAP 412 (1959)

This is the principal legislation of the parastatal Tanzania National Parks (TANAPA) that manages Tanzania's network of National Parks. TANAPA has a board of trustees appointed by the Minister, and a Director General appointed by the President. Under the NPO the following rules apply:

- it shall not be lawful for any person to enter or to be within a national park except under and in accordance with a permit that is issued under regulations made under this Ordinance (Part IV, Section 14.1);
- a person who owns a mining right in, over, and or in respect of land comprised of a national park, may enter and exercise the same within a national park if he has first given written notice to the Trustees and the Governor and complies with any conditions which the Governor, after consultation with the Trustees, may impose, provided that the Governor shall not impose any condition inconsistent with the nature of any such mining right granted to such person (Part IV, Section 15.1);
- the Governor may impose conditions as to the numbers of persons who may be employed within a national park without being in possession of a permit for the purpose of the exercise of any mining rights (Part IV, Section 15.2);
- any person who contravenes [Section 15.1 and Section 15.2] will be guilty of an offence against this Ordinance;
- no person shall hunt, capture or wound any animal (Part IV, Section 16.1); and,
- the Trustees may, subject to approval of the Minister, make regulations [to] (Part V, Section 18.1):
  - prescribe the conditions under which members of the public may enter, travel through, or reside in a national park;
  - provide for the issue of permits to enter, travel through and reside in a national park;
  - prohibit or regulate the lighting of fires within a national park;
  - prohibit or control the cutting, damaging or removal of any vegetation, whether alive or dead within a national park; and,
  - prohibit the destruction or defacing of any object whether animate or inanimate in a national park, and the removal therefrom of any animal or mineral product.

In summary, under the current and somewhat outdated legislation, mining is permitted in National Parks with written notice to the Governor, and under reasonable conditions specified by the Governor after consultation with the Trustees. The Trustees may make regulations subject to the approval of the Minister. Equally, TANAPA's recently approved National Policy for National Parks does not allow for mining within National Parks.

(b) Ngorongoro Conservation Area Ordinance CAP 413 (1959)

This is the principal legislation of the parastatal Ngorongoro Conservation Area Authority (NCAA) which is empowered to manage the Ngorongoro Conservation Area. NCAA has a board of trustees appointed by the Minister, and a Conservator appointed by the President. Under the NCAO the following rules apply:

- the Authority may, with the consent of the Minister, make rules prohibiting, restricting and controlling entry into and residence within the Conservation Area (Part II, Section 6.1);
- the Authority may make order either in relation to any particular parcel of land or generally in relation to the Conservation Area (Part III, Section 9.1):
  - prohibiting, restricting or controlling the use of land for any purpose whatsoever;
  - prohibiting, restricting, limiting or controlling:
    - the introduction, grazing, watering or movement of stock;
    - the firing, clearing or destruction of vegetation including stubble;
    - the use of wells, boreholes, water holes, watercourses, streams, rivers or lakes; and,
    - the introduction or removal of flora and fauna.
  - requiring, regulating or controlling:
    - the uprooting or destruction of any vegetation.
  - prohibiting, restricting or controlling:
    - the construction or extension of buildings or works, or restricting or controlling the siting thereof; and,
    - the construction or extension of any roads or tracks or restricting or controlling the siting or alignment thereof.
- any person who contravenes or fails to comply with any of the provisions of these bye-laws or any direction or conditions given by the Conservator or an authorised officer or agent of the Authority shall be guilty of an offence and shall be liable to conviction to such a penalty as may be imposed under the ordinance (Part V, Section 18.1).

There are no statements in the Ordinance specifically addressing the issue of mining in the Conservation Area. However, it does state that the Authority must allow entry and residence to anyone who is the legal holder of a mineral prospecting licence, mining lease or exploration licence. This implies that mining can occur in the Conservation Area, if the miner is holding the proper permits. Both the Mining Ordinance (CAP 123) and the Mining (Mineral Oil) Ordinance (CAP 399) give more protection to the Conservation Area than the NCA Ordinance. Both ordinances state that no person may prospect or mine in the Conservation Area unless he has first given notice to the NCAA and unless *he complies with all orders lawfully made by the Authority that are applicable to him.*

(c) Game Controlled Areas

Some 10% of Tanzania has been gazetted as Game Controlled Areas (GCAs). Wildlife and fish in these areas are protected under the Wildlife Conservation Act. However, human activity or settlement is not controlled and mining would therefore be legal.

(d) Forests Ordinance CAP 389 of 1957

Some 15% of Tanzania has been set aside as Forest Reserves for the conservation and controlled utilisation of forest resources. The Forests Ordinance, CAP 389 of 1957 is the principal legislation for the management of these areas by the Forestry Department. According to Part V,

Sect. 15, no person, in a Forest Reserve, without a licence or other lawful authority, may:

- cut, remove or set fire to any forest produce;
- clear, cultivate or break up any forest reserve land;
- erect any building, shelter or livestock enclosure;
- graze or pasture livestock;
- collect any honey or beeswax, or hang any hive; or,
- construct any road, path, watercourse or fence.

Mining is not mentioned in the Forests Ordinance, but mining without due authorisation from the Forestry Division would be an offence as miners would clear and 'break' Forest Reserve land, erect buildings and create paths. However, mining is possible if the Forestry Department and *Madini* can work together. Recently gemstones were found in a Forest Reserve and a mining zone was surveyed and demarcated through joint consultation between the Forestry Department and *Madini*.

1.5 Conclusions

The different legislation covering each category of protected area makes different provisions for mining within those areas. The mineral resources within the protected areas of Tanzania are extensive (Moshy in this volume). It is therefore imperative that a policy is developed concerning mining in protected areas.

Reference

Moshy, CMA (This volume). *Mineral potential in protected areas in Tanzania*.

2: MINERAL POTENTIAL IN PROTECTED AREAS IN TANZANIA

CMA Moshy
Commission for Geology, PO Box 90, Dar es Salaam, Tanzania

2.1 Introduction

Tanzania has vast areas of land with mineral potential. Around 30% of the surface area of Tanzania is gazetted as protected areas (PAs). Hence, much of this mineral rich land falls within either National Parks (NPs), Game Reserves (GRs), Game Controlled Areas (GCAs) or Forest Reserves (FRs). Exploiting mineral resources within PAs is a complex process because many Ministries and Departments are concerned with the natural resources sector. This paper demonstrates how the different ministries depend on one another. It is time to work together to develop Tanzania's natural resources whilst protecting the natural environment. For clarity, a few geological terms are defined below.

- A ***mineral*** is a naturally occurring inorganic element or compound.
- A ***mineral occurrence*** is a physical existence of a valuable mineral irrespective of its abundance at a particular area.
- A ***mineral deposit*** is a valuable mass of mineral at a particular area.

2.2 Mineral Potential in the Protected Areas

Minerals are divided into five categories: base metals; rare earth; precious metals; non metallic minerals; and, hydrocarbons. The location of important mineral deposits can be mapped relative to PAs devoted to wildlife conservation (Figure 1).

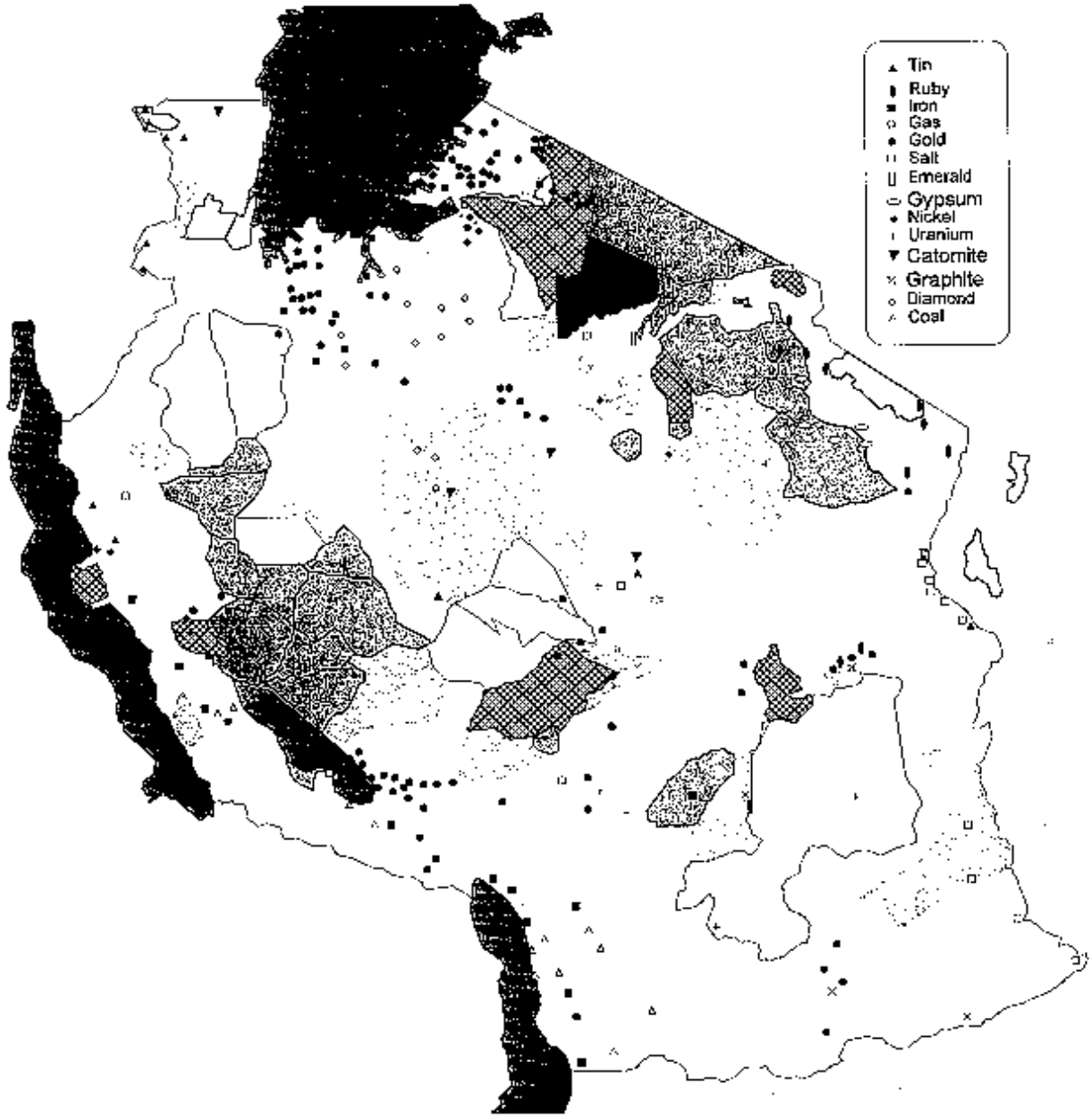
(a) Base Metals

The main occurrences of base metals (including nickel, copper, cobalt, zinc and lead) are in Mkomazi, Rumanyika, Orugundu, and Maswa GRs, and in Serengeti and Katavi NPs. Most of these need further study before reserve estimates of their size and nature can be given. Descriptions of the most important mineral deposits are as follows:

Mpanda Mineral field. The Mpanda mineral field has extensive lead-copper-gold-silver mineralisation in a number of places. The Mkwamba and Mnya Kalisa Mines operated at Uruwira in the Mlele GCA from 1950 to 1960. In 1974, a review of the deposits by a geological team of Russians and Department of Mineral Resources (*Madini*) staff, recorded an ore grade of 1 to 2% copper, 1 to 62.5% lead and 0.9% of nickel. The mine closed in 1960, after extracting copper ore worth US$ 5 million. However, the remaining deposit may be large enough to be mined economically.

Ngasamo, Wamangola and Beramango Hills. Substantial Nickel-Chromium and other base metal deposits have been reported at Ngasamo and Wamangola Hills in Maswa GR and at Beramango Hills in the Serengeti NP. Pitting by the Geological Survey Department in 1957 indicated 0.2% to 1.3% nickel. The area remains a good prospect for nickel and other base metals along with the Kabanga nickel deposit in Kagera Region.

Figure 1: Map Showing Location of Protected Areas Devoted to Wildlife Conservation, and the Deposits of Minerals Throughout Tanzania



Kagera Base Metal exploration project. The Australian Mining Company BHP-Kagera Mining is investigating a large deposit of nickel-copper-cobalt in the Kabanga area in Ngara District. The exploration work is a detailed follow-up survey of anomalies picked by a UNDP project from 1975 to 1980. Several other large anomalies scattered in the Kagera Region fall in the Lake Burigi-Kanyamasongo GCA, and in Rumanyika Orugundu and Biharamulo GRs.

(b) Rare Earth Metals

Rare earth minerals associated with carbonate intrusives have been reported at the Zizi area near Kisaki in the north of Selous GR. Another occurrence of Kerimas carbonate has been reported within the Ngorongoro Conservation Area.

(c) Precious Metals

Gold and silver have been reported in Serengeti and Ruaha NPs, Maswa, Rungwa and Biharamulo GRs and in Mlele GCA.

Kilimafedha Gold Deposit. Gold has been reported at localities in the Kilimafedha area within Serengeti NP. During the First World War Germans exploited Kilimafedha Hill on a small scale. In 1967 British geologists graded the deposit at 0.36 ounces per ton, equivalent to approximately ten grams of gold per ton. This is high enough to encourage mining. Gold mineralisation is also reported at Beramango and Nyamoma, west of Kilimafedha in Serengeti NP.

M*panda Mineral Field.* Gold production started in 1936 and peaked during the Second World War. After Independence, prices fell and Government introduced a mining policy that hampered mining operations, and consequently mining ceased. In the Mkwamba-Mnyakaliza and Sikitiko areas, within the Mlele GCA, gold is mineralised in quartz reefs employed in a shear Zone. Ore was graded at 5 grams of gold, and 553.4 grams of silver per ton. At Mkwamba gold mining can be extended beyond the borders of Mlele GCA.

Nyamirembe Gold Occurrence. In 1965, gold was found at Nyamirembe during a regional geological mapping exercise. Recently, artisanal miners have exploited gold believed to be chemically precipitated in a gravel layer. This lies under two to five meters of a surface layer of literate cover. The area is also a base metal prospect in Kagera Region.

Ngasamo-Wamangola Gold Occurrence. Between 1914 and 1918 Germans worked the Ngasamo prospect. They reported a recovery of 4,000 ounces of fine gold from 5,000 tons of ore. Ngasamo lies just outside Maswa GR but Wamangola lies within the GR. The Ministry has received several applications for gold Prospecting Licences for this area.

Iluma Gold Occurrences. Gold occurrence was reported south of the Dodoma by Madini and in 1972 at several localities by Itigi, particularly along Njombe and Kizigo rivers. In July 1992 artisanal miners stormed the Iluma area within the Rungwa-Kizigo-Muhesi GR complex. Recently Madini experts reported very low gold values from quartz vein samples. Gold mined by the artisanal miners is believed to be leached from crushed quartz reef and chemically precipitated in a gravel layer on the water table.

(d) Other Metallic Minerals

Tin and tungsten minerals occur in Ibanda GR in Kagera Region. Kaishunga, Rwamugasha and Lower Murongo are the most important locations and were exploited between the early 1900s and

1970. Several applications for tin and tungsten Prospecting Licences have been received by the Ministry.

(e) Non Metallic Minerals

Non metallic minerals including uranium, gemstones, and gypsum occur in various GRs.

Uranium Minerals. Uranerzbergbau, a German exploration company established that the Karroo sandstone at Madaba river area in the Selous GR hosts substantial uranium deposits.

Gemstones. Gemstone deposits are scattered throughout Tanzania. Ubendian and Usagaran rocks are hosts in south-west and eastern Tanzania, respectively. The general view is that few varieties of gemstones occur in the GRs. The most significant occurrence is at Umba in Mkomazi GR. The State Mining Corporation (STAMICO) mined mostly rubies, garnets and sapphires there until 1972. Private mining companies have applied for mineral right licences and the Ministry has received several applications for gemstone Prospecting Licences.

Gypsum. The Mkomazi gypsum is mined on a small scale partly in the Kitwai GCA.

(f) Hydrocarbons

Several companies have been speculating on the presence of hydrocarbons in Selous GR.

2.3 Conclusions

The mineral sector appreciates the wildlife and beauty of Tanzania, and respects any standardised law that aims to preserve this for posterity. Consequently, this meeting is welcomed. It has helped forward the process of exploiting natural resources within GRs whilst minimising disturbance to their ecology.

The mineral sector has received several applications for mineral rights within the GRs. At present, applicants are always directed to the Director of Wildlife to apply for a working permit to operate within the GRs. The Director has responded positively, which reflects the co-operation between the two sectors.

The mineral sector supports the establishment of a forum, involving the parties that manage the natural resources in the GRs and NPs. This forum should prepare regulations and guiding instructions in the exploration and mining of mineral resources. The mineral sector views this meeting as a step towards finalising the few differences between the parties managing the natural resources in Tanzania.

3: THE PROCESS OF OBTAINING MINERAL RIGHTS IN TANZANIA

S Nghambi
Commission of Mines, PO Box 9153, Dar es Salaam, Tanzania

3.1 Introduction

Tanzania has diverse mineral resources. Those with the greatest potential for development are gold, diamonds, gemstones, nickel, coal and iron ore, and a range of industrial minerals. These include kaolin, soda ash, salt, gypsum, mica, magnesite, limestone, phosphate, coal, and graphite, and are as yet untapped (Moshy in this volume).

Some of these minerals, particularly gold, mica and diamonds, have been explored on a small scale since the 1930s. Mining during the colonial period was conducted largely by foreign companies and contributed approximately 10% to GDP. Following Independence in 1961, Government encouraged a state-directed development strategy. As a result all foreign companies withdrew, which led to the demise of the mining industry of Tanzania. In 1972, the Government formed the State Mining Corporation (STAMICO) to implement the mineral development strategy, which was to service the rapidly disintegrating mining sector. During the 1970s and 1980s the mining industry was nationalised, accelerating the decline of the sector. Furthermore, uncontrolled small scale mining began to replace industrial mining as the dominant force in the sector. Although this informal production contributed to employment generation and income growth in rural areas, it has had little impact in terms of fiscal revenue. Mining has been undertaken largely without modern equipment and with poor, dangerous methods and techniques.

The probability of discovering economically productive mineral deposits in Tanzania is high. Extensive regional reconnaissance and geophysical work have been on-going since before Independence. A country-wide airborne geophysical survey conducted from 1979 to 1981 generated primary information on mineralisation for use by potential investors.

3.2 Investment Environment in Tanzania

The investment climate improved markedly when Trade Liberalisation was introduced in 1985. Economic programmes have been launched in collaboration with bilateral and multilateral institutions. These include the Economic Recovery Programme and more recently the Economic and Social Advancement Programme.

As a move towards an open economy, Government passed the National Investment (Promotions and Protection) Act of 1990. This led to construction of the Investment Promotion Centre (IPC) that has handled many inquiries from domestic and foreign investors and has helped establish scores of new ventures, including several in mining. Although the Act excludes investment in petroleum and minerals, it designates mining a priority area for investment.

3.3 The Mining Policy

The Government of Tanzania encouraged investment in the mining industry during the 1980s. The Mining Act of 1979 began the process by regulating the mining sector, and laying down the legal framework for large and small scale mining. The most recent step is the establishment of

the National Investment Promotion Policy (NIPP). Policy papers issued on *Small Scale Mining Policy* and *Large Scale Mining Policy* and adoption of the Model Agreement in 1988 have also contributed to a more liberal mining policy. To summarise, policy has changed in three crucial ways:

- the Mining Policy Papers issued in 1983 proposed that minerals were part of the nation's heritage. As such, a Government monopoly developed through STAMICO. Under NIPP, however, a Government majority participation in mining ventures is no longer mandatory;
- the Mining Act of 1979 allows Government a right to intervene in some aspects of mining. The NIPP established that, notwithstanding the level of government share holding in the company, mining operations remain the responsibility of the investor; and,
- the Liberalisation Policy on Mineral Trade in 1987 has produced a remarkable improvement in mineral trade through privatisation of gemstone mines and issuance of mineral dealers licenses. Mineral exports have increased steadily year after year.

The mineral sector remains one of the main sources of economic development. In the wake of global political and economic changes in the 1980s, the Government of Tanzania introduced macro-economic policy changes to promote social and economic development. These are now affecting the sector positively. In 1992 and 1993, the sector had a growth rate of 28% and 25% respectively, the highest of any in Tanzania. Industry must take over the role traditionally played by Government in this sector. A new mineral policy is required to guide both Government and the industry towards this goal.

Introducing correct sectoral changes could realise the potential contribution of mineral resources to the sustained economic growth and development of the country. The objective is to increase the contribution of the mineral sector to the economy by encouraging the exploration and development of the nation's mineral resources. The objectives of Tanzania's Mineral Policy will be to:

- create awareness of mineral potential in Tanzania and encourage the exploration of the nation's mineral resources for development and production;
- promote the transformation of informal artisanal mining into formal, organised and efficient operations capable of further self-sustainable growth;
- encourage the exploration of minerals required by home industries, and encourage supply and service industries that support the mining sector;
- ensure that exploitation and utilisation methods meet acceptable environmental and conservation of mineral resources standards;
- generate employment for the rural population and promote development of the mining centres;
- earn local and foreign moneys for Government;
- promote technological advancement in the mining industry to cope with the new demands; and,
- provide the effective institutional capabilities and framework necessary to meet the demands of a growing mining sector.

(a) Investment Guarantees and Protection

Although economic development in Tanzania is based on socialism and self reliance, the new policy emphasises the importance of the private sector. Government recognises the importance of protecting investments for investors, and of fair and stable opportunities and predictable treatment. Thus, Government undertakes to maintain a legal framework that guarantees protection to investments in Tanzania, whether domestic or foreign. Hence, contractual and property rights

will be protected under the Tanzania legal system. In accordance with the Tanzania Constitution, private investors, including those in mining, are protected against nationalisation or any other intervention. If nationalisation becomes necessary, the owner shall receive prompt and fair compensation that will be transferable.

Further property guarantees are provided under the Multilateral Investment Guarantee Agency (MIGA) to which Tanzania belongs. Efforts will be made to settle disputes between Government and foreign investors amicably, as per section 29 of the National Investment Promotion and Protection Act, 1990. Where necessary, such disputes will go to arbitration according to the rules and procedures of ICSID (the International Centre for the Settlement of Investment Disputes).

3.4 Legislative Framework

The Mineral Resources Department administers the mining sector in accordance with the Mining Act of 1979. The Mining Act establishes the framework governing exploration and exploitation of mineral resources, and regulates the mining of gold, diamonds, gemstones and mineral trading.

(a) Licensing Procedure

Rights over minerals in Tanzania are vested in the state as per section 5 of the Mining Act. However, the Mining Act does provide for the retention of ancestral rights to a few minerals (Section 97). The organisation and administration of the mineral sector are the responsibility of the Minister assigned to mining affairs, assisted by the Commissioner for Mineral Resources.

Licences are issued according to: the scale of mining; the mineral involved; and, the stage of mineral development. For example, small scale mining is undertaken under a Prospecting Right (Section 70) while commercial quantities of a mineral are mined by Registered Claim (Sections 74 and 75). In the case of large scale mining operations, there are three mineral right licences covering reconnaissance, prospecting and mining (Part III of the Mining Act).

Potential licence holders must satisfy certain requirements to demonstrate their financial and technical competence to carry out the appropriate operations. The Mining Act links renewal of *any licence to the general performance of the licensee.. The requirements and procedures* stipulated by the Mining Act are summarised below.

Reconnaissance Licence. A Reconnaissance Licence is granted by the Minister (Section 15) and gives exclusive rights to reconnaissance for the stipulated minerals in the area. The Licence is granted for a maximum of one year and may be renewed for a further year. A Reconnaissance Licence may be extended for the period between submission of an application for and granting of a Prospecting Licence,

Prospecting Licence. A Prospecting Licence is granted for a particular mineral and gives exclusive prospecting rights in an area. A Prospecting Licence will not be granted for areas already under claim or mining. Applicants for a Prospecting Licence must:

- identify the minerals desired during the period for which the licence was issued;
- submit particulars of their financial and technical resources;
- submit a work programme with costs; and,
- submit proposals for the employment and training of citizens of Tanzania.

A Prospecting Licence is granted for a minimum area of one block (50 sq km) and maximum 3

blocks (150 sq km). The same applicant may be granted more than one Prospecting Licence in various areas at any one time. The Licence is granted for a maximum of three years and is subject to two renewal periods not exceeding two years each. Applications for renewal must be made not later than three months before expiration of the licence. Normally, at each renewal, the licensee must relinquish 50% of the area under the licence

Mining Licence. A Mining Licence is granted for the development and production stages of a large scale mining operation. The holder has the exclusive right to prospect and mine in the area and to dispose of any mineral product recovered. The licence may be granted for a maximum of 25 years, or the estimated life of the ore body, whichever is shorter. It is renewable for an additional maximum of 15 years on application. No mining licence will be granted unless:

- there is a programme of proposed mining operations;
- the programme takes proper account of environmental and safety factors;
- the applicant will ensure the cost efficient and beneficial use of the mineral resources;
- the area of land sought is not in excess of the area reasonably required to carry out that programme;
- the applicant has adequate financial resources, technical competence and experience to mine effectively;
- the applicant's proposals for the employment and training of citizens of Tanzania are adequate;
- the applicant's proposals with respect to the procurement of goods and services obtainable within the United Republic of Tanzania are satisfactory;
- any relevant option given pursuant to Section 32 of the Mining Act has been exercised and given effect to or satisfactory arrangements have been made for that purpose; and,
- the applicant is not in default.

(b) Restriction on Exercise of Mineral Rights

According to Section 48 of the Mining Act, the registered holder of a Mineral Right (Reconnaissance Licence, Prospecting Licence, Mining Licence or Claim Title) will not exercise any of his rights under his licence or under the Mining Act in the following areas:

- (except with the written consent of the responsible Minister)
  - i) any land dedicated or set apart for any public purpose (other than mining);
  - ii) any land dedicated as a place for burial;
  - iii) any land which is the site of, or within 100 yards of, any building, reservoir or dam owned by Government;
  - iv) any land forming part of a licensed or government aerodrome or any government landing ground or which is within 1,000 yards of its boundaries;
  - v) any land on which is built, or which is within a military installation; and,
  - vi) any reserved area, or any protected monument declared under the Antiquities Act

- (except with the written consent of the lawful occupier of)
  - i) any land which is the site of, or within 200 yards of any inhabited, occupied or temporarily unoccupied house or building;
  - ii) any land within 50 yards or land which has been cleared or ploughed or otherwise prepared in good faith for the growing of agricultural crops or upon which agricultural crops are growing;
  - iii) any land from which, during the year immediately preceding, agricultural crops have been reaped; or

iv) any land forming part of an aerodrome, other than an aerodrome referred to above.

- (except with the written consent of the authority having control of)
  - i) any land in a National Park declared under the National Park Ordinance (CAP 412);
  - ii) in any Forest Reserve declared under the Forest Ordinance (CAP 389);
  - iii) in any Game Reserve declared under the Wildlife Conservation Act 1974 No. 12;
  - iv) in a range development area declared under the Range Development and Management Act (CAP 569); or,
  - v) in the Ngorongoro Conservation Area (CAP 430).

- any land reserved for the purpose of any railway, or which is within 1090 yards of the boundaries of any land so reserved (except with the written consent of the responsible railway authority);

- any land within any city, municipality, township or demarcated settlement (except with written consent of holders of surface rights, and of the responsible Minister or the authority having control over the city, municipality, township or demarcated settlement);

- any street, road or highway, and any land within 100 yards of any bridge, public ferry, culvert or drift in any street, road or highway, pipeline or power line, except with the written consent of the responsible Minister or of the authority having the control of the street, road, highway, bridge, ferry, culvert, drift, pipeline or power line;

- any land within 400 ft of every point which has been notified to the Commissioner by a licensee under the Mining (Mineral Oil) Ordinance as a site for the drilling of a bore hole in connection with prospecting, searching or exploring for mineral oil, except with the written *consent of the Minister;*

- any land over which an oil prospecting licence or an oil mining licence or lease has been granted under the Mining (Mineral Oil) Ordinance and is still subsisting except with the written consent of the Minister; or,

- any area of land which is a diamond area, as defined in Section 2 of the Diamond Industrial Protection Ordinance, except in the case of Reconnaissance Licence, Prospecting Licence or Mining Licence which related to diamonds.

3.5 The Fiscal Regime

Government recognises the importance of effective incentives in mobilising appropriate local and foreign investments. Accordingly, under the Mining Policy, the following categories of incentives will be made available:

(a) Taxes

The principal taxes affecting the mining industry are corporate tax, customs duty and sales tax. Royalty is charged to compensate the Government for ore depletion.

Corporate tax. Corporate tax on profits is levied under the Income Tax Act 1973 and subsequent amendments. Corporate Income Tax in Tanzania is 35% and 40% for resident and non-resident

companies respectively on all taxable income. For mining companies a variety of tax incentives do exist and lead to lower effective rates of taxation. For example, for the first four years of positive taxable income, the rate is 22.5% per annum for local and foreign companies. For the fifth year onwards the normal tax rates apply.

Customs duty and sales tax. All exploration and mine development equipment, machinery and vehicles purchased and imported before the start of regular production are exempt from customs duty and sales tax. The company concerned should apply for exemption each time it imports equipment and machinery.

Withholding tax. Payments of dividends, interest on loans, management fees, and so on, are subject to withholding tax. The current withholding tax rates on dividends of 20% and 10% for non-residents and residents, respectively, shall be reduced to 10% and 5%, respectively. Dividends shall be governed by the Companies (Regulations of Dividends and Surpluses and Miscellaneous Provisions) Act No 22 of 1972. This Act regulates the distribution of profits and uses of cash flow of certain Boards and Corporations, and makes special provisions relating to companies.

Capital expenditure deductions for allowances. Under the Income Tax Act No 33 of 1973, all pre-operational expenditure for exploration and development are deductible at a rate of 40% in the first year of mining operations and 10% for the next six years of operation. For capital expenditure in respect of specified minerals, 100% capital allowance is available in the year that expenditure is incurred and no additional allowance may be claimed. Current specified minerals include copper, coal, gold, lime magnesium, bentonite, magnesite, meerschaum, mica, tin, ore, tungsten ore and vermiculite. Losses in any particular year may be carried forward and offset against taxable income of the following year, provided such losses do not exceed the capital allowance for the year in question. All allowances aim to give a mining project a short pay-back period.

(b) Royalty

Royalty payments are levied according to Section 88 of the Mining Act, 1979. Current rates are set out in the Mining (Royalty) Regulations of 1989. These are payable on the net value received for minerals (Table 1).

(c) Overseas Retention Scheme

A retention scheme on off-shore accounts of up to 100% is permissible for mining companies, and for gold and gemstone dealers' licence holders. This permits an export oriented mining venture to operate without constraints on imported production inputs and it assures investors to service their debts without difficulties.

(d) Rent, Fees and Other Charges for Minerals

Various rents, fees and other charges concerning minerals are charged (Table 2).

Reference

Moshy, CMA (This volume). *Mineral potential in protected areas in Tanzania.*

Table 1: Royalty payment rates

Mineral	Rate
Diamonds	10% of net value
Gemstones	5% of net value
Gold	3% of net value
Coal and Salt	2% of net value
All other minerals (except aggregate and sand)	3% of net value

Table 2: Preparation and annual rental fees on mineral rights licences currently in force

Preparation Fees	Local Company (T Shs)	Foreign Company (US $)
Reconnaissance Licence (RL)	20,000	200
Prospecting Licence (PL)	30,000	300
Mining Licence (ML)	50,000	500
Renewal of Mineral Rights (RL, PL, ML)	10,000	100
Fees for transfer approval by Minister (as per Section 60 of Mining Act for Mineral Rights)	10,000	100
Fees for Certificate of Surrender (as per Section 55 of Mining Act for Mineral Rights)	10,000	100
Annual Rental Fees (as per Section 93 of Mining Act)		
A. Reconnaissance Licence (per sq km)	500	5
B. Prospecting Licence (per sq km)	2,000	20
C. Mining Licence (per sq km)	150,000	1,000

4: THE ILUMA HILL GOLD MINING AREA

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4.1 Introduction

This report evaluates the geology and mining activities at the Iluma Hill mining area. The area has been intensely mined by artisans since 1991. It is now being proposed for gazettement as part of a Game Reserve (GR) by the Manyoni District and Singida Regional authorities. Due to delays, gazetting was not completed before mining activities got underway. The Office of the President has requested the Departments of Mines and Wildlife to agree to allow mining to continue while the GR is gazetted. The Department of Wildlife wish to understand the full implications of the mining activities, so that they can be accommodated within the management plan for the proposed GR. Accordingly, CSA Africa were engaged to provide information on:

- the nature, size and extent of the ore body;
- the economic potential of the surrounding area and the possibilities of extension of the present mining area; and,
- the possible duration of present mining activities.

From this baseline data CSA Africa were also asked to suggest options for:

- a boundary for a zone allocated to mining activities;
- the improvement of mining practices to minimise damage to the environment with particular reference to the use of mercury and siltation in the adjacent rivers; and,
- the practicalities of encouraging artisanal, small scale or industrial mining in the area with consideration of: local employment needs; legality within the Tanzanian mining code; the legal enforcement requirements of a future GR; and, the preservation of an area included in a nationally important water catchment.

An estimate of the extent of further mining potential in the area was requested, using data from the Department of Mines.

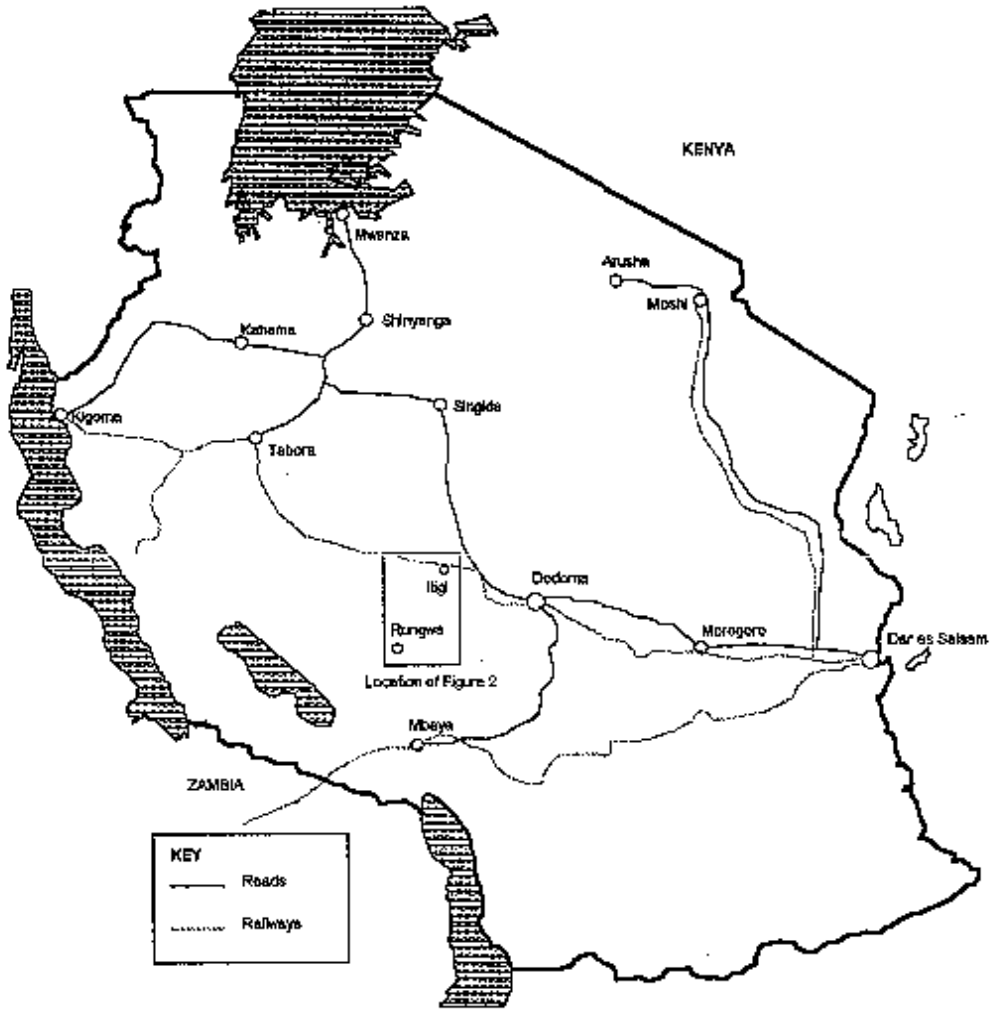
An aerial reconnaissance of the area and a field visit were carried out in late February 1994, followed by preparation of this report, and the holding of this workshop. One aim of this study is to facilitate the production of a section on gold mining to be included in the Rungwa-Kizigo-Muhesi GR Complex Management Plan.

4.2 Location of the Area

he Iluma Hill gold mining area is centred at 06 21.5' South 34 43.0' East, in the eastern part of the proposed Muhesi GR, approximately 5 km inside the eastern boundary (Figures 1 and 2).

Access to the area is via the secondary road from Manyoni that passes through Chikola, also known as Itetema. A smaller motorable track leaves this road at the village of Ndabulu, and leads directly to the mine site after approximately 30 km. A collapsed bridge on a tributary of the Kisigo River makes one diversion necessary, but generally the track follows well-drained watersheds and is easily traversed in all but the wettest times of the year. The country surrounding the mine is undulating, with frequent granite ridges and kopjes. The vegetation is light woodland savannah, with occasional thickets.

Figure 1. Map of Tanzania showing the general location of the area



4.3 Geology of the Iluma Hill Area

(a) Regional Setting

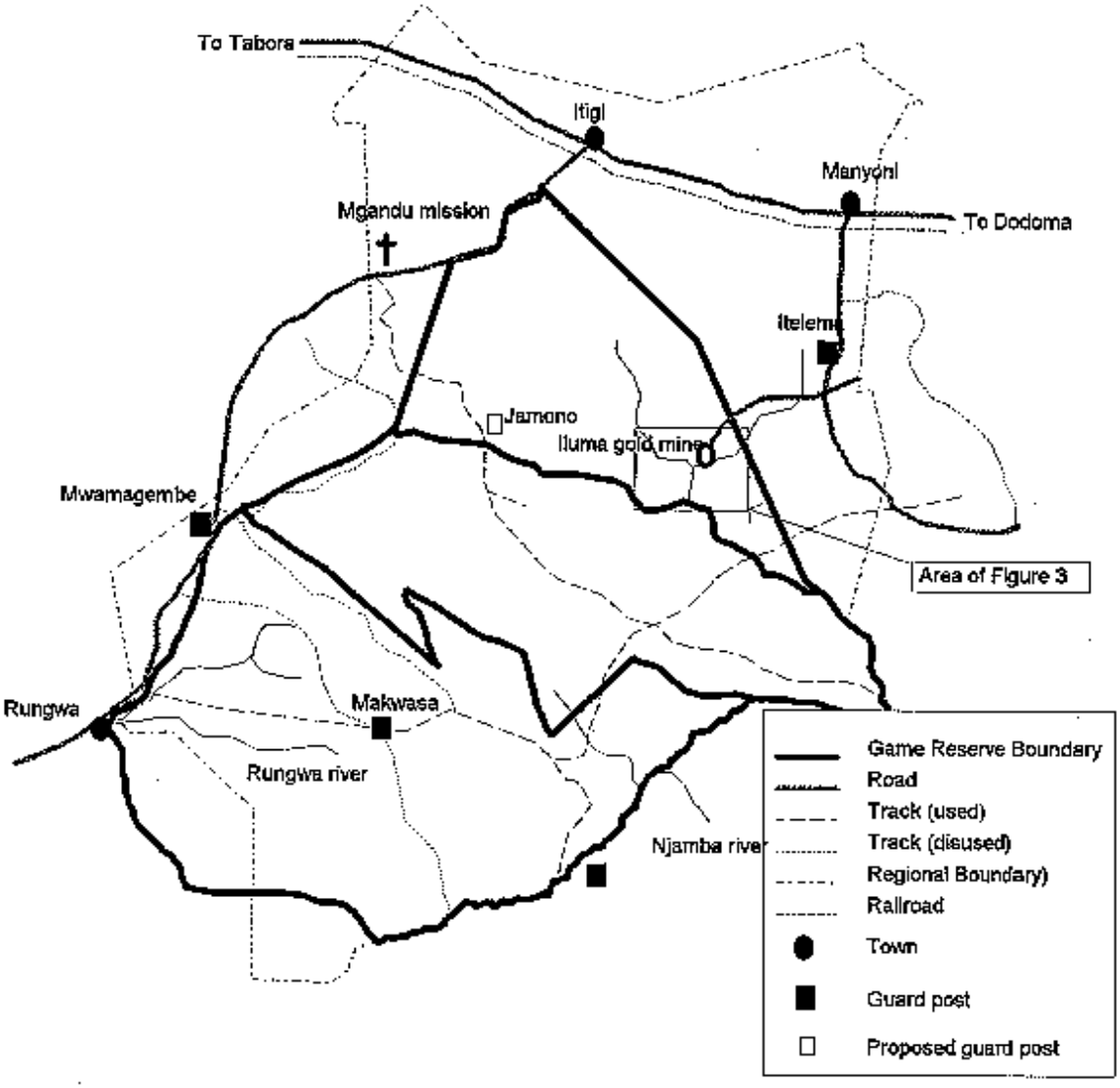
The area is underlain by rocks of the Dodoman series. Although the exact provenance of these Arcean basement rocks is doubtful they may be over 3.0 billion years old.

The suite may be divided into two parts:

- banded grey gneisses, granites and migmatites; and,
- hornblende sericite schists, talc chlorite schists, hematite quartzites and garnet hornblende gneisses.

These rock types have been isoclinally folded along upright ESE trending axes, although the latter rocks mentioned above occur in discrete keel-like forms, often associated with K-rich, intrusive granites. The assemblage represents an amphibolite grade metamorphism of an original greenstone

Figure 2. Rungwa-Kisigo-Muhesi Game Reserve complex, showing the general location of the mining area



terrain, similar to the Nyanzian of the Lake Victoria Goldfield, although not necessarily of the same age (Stockley 1948; Saggerson 1972).

More recent evidence, including the occurrence of gold in equivalent situations, tends to confirm this view. This has implications for the economic potential of the area, especially in comparison with the Lake Victoria Goldfield.

(b) Iluma Hill Area

The Iluma Hill area is well exposed by local standards, due largely to the unusually shallow depth of weathering. Rock pavements can be easily examined in the area to provide an excellent indication of the local geology. The oldest rocks are fine grained banded amphibolite gneisses, typical of a high grade terrain. These exhibit isoclinal folding about an axis trending 110°, with sub horizontal hinges.

In many outcrops these structures are cross cut by bands of highly leucocratic granite, that is only weakly deformed and probably represents a late tectonic mobilisate, arising from partial melting of the banded gneisses. This is the only rock exposed in some areas, especially south of the main mining area. This suggests that large volumes of this mobilisate were developed and intruded among the bodies of older gneiss. This rock type also forms the hill at 92 94 00 N, 06 90 80 E (UTM Grid). Brittle fractures with concomitant quartz veining, displaying dextral displacement, are commonly encountered trending between 130 and 165°.

A linear outcrop of a pink K-rich granite, trending east-west, occurs in the area south of the mining village. The country rock of the main mining area is a similar, but more sheared variety of this, with fracture surfaces, abundantly coated with epidote. A similar linear exposure, also with abundant epidote filled fractures, outcrops just north of the main track where it approaches Iluma village.

The regional setting consists of banded amphibolite gneisses to the north of the mining village, extending probably to 1 km south of the village. These gneisses contain extensive intrusions of late tectonic, leucocratic granites. These range in width between tens of centimetres and hundreds of meters, for example between the main mining area and the river. The area south of these gneisses is separated from them by a contact trending 110°, underlain by a continuous body of leucocratic gneisses.

At least three important shear zones transect the area: the major one controls the mineralisation at the main mining area. A second shear occurs approximately 2 km north of this, about 500 m south of Mashama Hill, with a similar trend, and a third, probably parallel zone occurs about 1 km south of the main mining zone. The best exposed shear has a major mylonite zone within a broad zone of intensive shearing with the development of a strong planar fabric. The second and third shears are not exposed so well, but spoil from dumps indicates a similar situation. The intrusion of the K-rich granite is closely associated with these shear zones. It may have intruded along the initial movement plane, being sheared in turn by subsequent reactivations.

4.4 Economic Geology Considerations

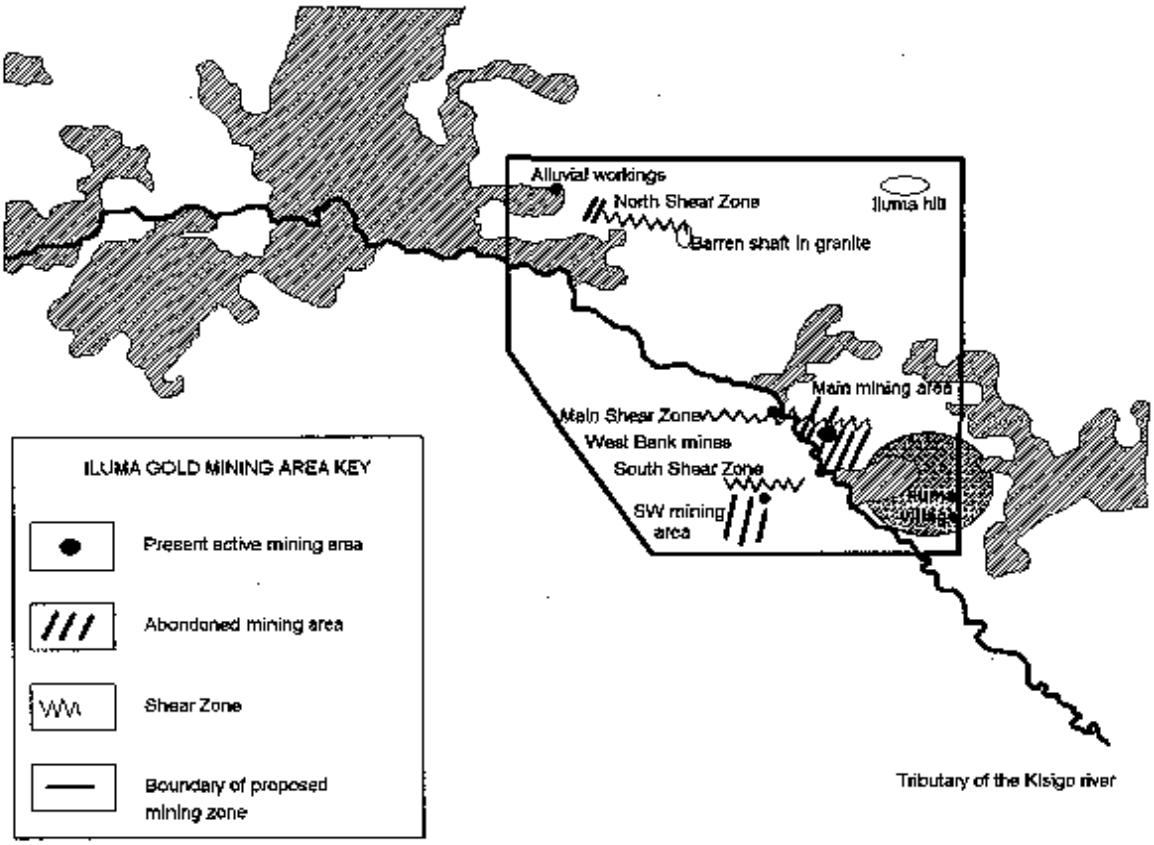
(a) Description of Mining Areas

Main mining area: This roughly rectangular area, immediately west of Iluma village measures approximately 300 m along an ESE axis by 250 m (Figure 3). The edges of the area are hard to define, first because activity tails off gradually, and second, because over the period of mining, a far larger area was worked. This can be seen to have been extensively pitted.

The main area is underlain by mildly altered, sheared K-rich granite, with rafts and fragments of amphibolite and leuco granite. The granites are cut by thin (1-5 cm) quartz stringers and veinlets, many of which are rusty in colour. Float and spoil of larger fragments of glassy quartz also indicate the presence of larger veins. The rocks are extensively cut by epidote filled fractures. The amphibolites are cut by shears that have reverted to biotite and tremolite-actinolite. Traces of malachite and azurite are frequently found.

One of the main mining sites is centred on the main shear. Here a truncated dyke like body of very fine grained basic material, with intensely sheared rusty quartz margins has been cross cut by a quartz filled shear trending 165°. Gold mineralisation is associated with quartz veining and crush and mylonite zones. The gold is unusually coarse and 3 mm fragments are common.

Figure 3. The mining areas in the Rungwa-Kisigo-Muhesi Game Reserve complex



The largest working is at the intersection between the main shear zone and two subsidiary shears, mentioned above. This intersection was followed down for over 50 meters and coarse nugget gold, reputedly valued at Tsh 1.7 billion, equivalent to approximately US$ 4.5 million at the prevailing exchange rate was extracted. Assuming a price of US$ 6.00 per gram this gives a production of c 750 kg.

Such a rich pocket would have been produced by an unusual sequence of events. The initial mineralisation, concentrated along the shear zone, is likely to have been re concentrated during the second quartz vein forming event. Percolation of ground water exploiting this vertical weakness, would have remobilised the gold and re deposited it as coarse nuggets. The gold appears to be associated with copper, presumably chacopyrite, below the weathering zone. There is less than usual evidence at this site for abundant pyrite. The rocks are not highly altered, although evidence of much more highly altered leucocratic granite is found in the area between the main workings and the river.

At the shaft presently being worked about 200 m north of the main mining area, the spoil consists largely of amphibolites cut by biotite filled shears. In contrast to the main mine area there is abundant development of pyrite in shears. Gold values were not reportedly very encouraging at this site.

West Bank Mines: Immediately west of the river, on the same shear zone, a smaller mine has been developed. Here the mineralisation is associated with a mylonite zone and an adjacent shear zone

at the contact between amphibolitic gneiss on the north side and leucocratic granite on the south side. The shears are exploited by small K-spar rich veinlets. The mylonite zone, of up to 30 cm wide, consists of comminuted quartz and might have developed along an older quartz vein.

The main zone, trending 109° is cut by a second quartz vein trending 155° and it is here again that the richest mineralisation has been concentrated. Malachite and azurite are not uncommon in fractures.

Three smaller mines, essentially prospect pits have been opened on the shear zone, over a distance of 400 m to the west. However, little gold has been recovered. Although the contact is clearly revealed, the shearing and mylonitisation are greatly reduced and there is little evidence of the intrusion of the K-rich granite.

SW Mine: A small group of shafts have been sunk into the sheared contact between amphibolites and granodiorites about 1 km SW of Iluma village. A grey mylonite zone is developed, trending approximately 100°.

This area is reported to have produced Tsh 700 million worth of gold, but has been a centre for eluvial rather than extensive underground mining.

Mashama-Iluma Area: Another shear zone but less richly mineralised, has been developed, with the same trend south of Mashama Hill. An active shaft, sunk adjacent to the SW end of Mashama Hill, has penetrated K-rich granites with reportedly no gold recovery. The rocks are mildly epidotised, but otherwise gave no indications of likely mineralisation.

A small number of test pits have been made about 500 m south of the west end of Mashama Hill. They are sunk into sheared K-rich granite, intruded into amphibolite. Spoil showed some quartz veining, but indicates low gold values. Approximately 500 m WNW of this area and 500 m SW of the west tip of Mashama Hill, half a dozen village miners are working approximately 0.25 ha of alluvials in a shallow creek bed. Daily recovery per man is said to be worth Tsh 2,000 or perhaps 0.3 grams. The area is unlikely to be of economic importance. The alignment of these areas and the similarity of the rocks and their relationships suggests that a weakly mineralised shear zone traverses this area.

Kopje at 929400N 069080E: A shaft adjacent to the above kopje, is a "wild cat" hole sunk into leucocratic granite, with no report or signs of a mineralised structure.

(b) Summary of Economic Geology Findings

The Iluma Hill deposits exhibit many classic features of Tanzanian high grade terrain mineralisation. The original source of the gold remains obscure. It may be derived either from metamorphosed greenstone remnants, containing original volcano sedimentary exhalative occurrences or by sweating out from basic and intermediate rocks during granitisation. Gold, re mobilised from these protore sources, may have been concentrated along the hydrothermal fluid conduits such as shear zones and fractures, that form the major structures that transect the area. These processes would have been enhanced by the introduction of heat and fluids during the intrusion of the K-rich granites, which appear to be controlled by the same structures.

Such deposits are mined elsewhere, for example in Western Australia using new, cost-effective techniques. These allow treatment of high volumes of relatively low grade ore when they are available by open cast mining techniques and where sufficient depth of weathering allows

oxidation of gold bearing sulphides. This weathering allows free gold to concentrate naturally and it is in this form that it is most easily recoverable. Such conditions do exist elsewhere in Tanzania, for example at Bulyanhulu, although the depth of weathering is considerably deeper there than at Iluma.

An extensive stock work of small veins may exist in the major sheared granite at Iluma and this must be considered a prospective target.

(c) Possible Worth of the Deposit

A mining company would need to find a deposit of at least 1 million metric tonnes, grading 10 grams per ton gold to cover the immense costs of finding, proving and mining such a deposit. The Iluma Mine area could host such a deposit and must be worthy of a systematic exploration investigation. However, there is absolutely no guarantee that such a deposit exists.

(d) Mining History of the Area

The following account is gathered from discussions with miners at Iluma. It is consistent with events in such circumstances elsewhere in Tanzania.

The deposits were first discovered in 1991. Their discovery led to a local gold rush involving, at its peak, over 5,000 and probably 10,000 miners. This represented a relatively small percentage of the floating population of 500,000 miners in Tanzania. A thriving village sprang up in the area and a reasonable dirt track connects it to the main road.

Initially, the mining concentrated on the eluvial and coluvial deposits close to the outcrops of the shear zones and the gentle slopes draining them that run towards the river. It is virtually impossible for village miners to operate below the water table, and this probably hampered the small amount of mining of the alluvials in the flats adjacent to the river. Other mining areas were opened up in the shallow creeks immediately adjacent to the north of the present mining area. Consequently the west and south mining areas were discovered along with other areas adjacent to Mashama Hill.

Depth of artisanal mining is limited by the degree of weathering. In many areas of Tanzania weathering allows excavation down to 30 m or more. However at Iluma, the workers quickly encountered hard rock. Consequently, mining was concentrated where "hammer and tap" mining of hard rocks were likely to pay dividends. For example, these included areas of deeper overburden adjacent to the river, and rich pockets of gold at the intersection of shears and quartz filled fractures.

The social and domestic conditions in the initial stages of mining were probably desperate. There were reportedly a considerable number of fatalities, due partly to cave ins and other mining accidents and violent disputes over possession of mining sites. One witness claimed that 1000 people died over the three year period. Poor health practices due to overcrowding in temporary villages, also led to disease, including cholera. Substantial areas of woodland were cut down to provide timber and space for shambas. As elsewhere, the CCM and its policing organisation, the Sungu Sungu, made a major contribution in bringing peace to the area, and Iluma village is now organised by the CCM cadre.

Following the recovery of the easily acquired gold and hastened by news of gold discoveries elsewhere, the population dwindled rapidly during 1993. The present population is estimated to

be 200 and the village is a shadow of its former self. Gold mining is a dry season occupation in Tanzania, partly because of the danger of wet pit walls collapsing and partly because part time miners return home to cultivate their shambas.

(e) Mineral Claim Pegging in the Area

Beacons for six mining claims were found in the area. These had been pegged by:

- Bakari A Madeka, PR 17659, Pegged 12 12 91. No recorded claim number;
- Timothy M Lazarus, PR 17549, Pegged 09 01 92. No recorded claim number;
- B J Kiraka & J O Okumba, Three Claims, PR 21604, 05 & 06, Pegged 28 01 94. No recorded claim numbers; and,
- Shahanga, PR 18121, Pegged 19 06 92. No recorded claim number.

A member of the Department of Mineral Resources (*Madini*) staff noted that only the claim of Madeka had been ratified. However, the required claim number was not recorded nor was the renewal of the claim advertised since 12/12/92. Therefore, none of these claims appears to have any legal status, and are perhaps mere subterfuges to discourage other miners.

(f) Future of the Present Mining Activities

It is difficult to predict for how long the current activities may continue. A small permanent village has been established and small scale gold recovery and mining activities could continue almost indefinitely, although most of the easily obtained gold has probably already been mined. Unless a new unexpected rich pocket is found it is unlikely that the area will attract another gold rush.

An important factor is the level of control the authorities exert over illegal activities in the area. If the authorities ban all mining outside the one possibly legal claim, activities would be severely curtailed. The claim in existence has a finite life of one year from the date of issue and then is subject to possible renewal.

(g) Environmental Aspects of Present Mining Activities

Two special causes of environmental degradation in the area are:

- the introduction of excessive silt into the adjacent river; and,
- the use of mercury in gold recovery and it's subsequent escape into the environment.

Silt do not appear to be a substantial problem. The area presently mined is small compared to the adjacent area of proposed Muhesi GR. Silt from dumps usually finds its way into nearby pits rather than into the drainage, so filling them up. Abandoned areas quickly recover vegetation growth and further run off is rapidly reduced. Only trivial quantities of sand and gravel are washed in the river and one minor storm erased all traces of mining activities.

Artisanal miners use mercury to recover gold. Mercury and its compounds are highly toxic and can be absorbed by ingestion, inhalation, and through the skin. Poisoning results in severe inflammation of the digestive tract. The absorbed mercury is concentrated in the kidneys, where it poisons the blood filtering system. This results in renal failure, the accumulation of toxic substances in the blood, leading to death. Typically mercury is added to the gold pan during washing and any gold present dissolves into the mercury. Later the mercury is boiled off leaving

the gold in the dish. Unfortunately the use of recovery methods such as mercury retorts is unknown in the area, and typically the mercury vapour condenses immediately on cooling and falls to the ground as liquid mercury. To make matters worse, miners tend to perform the boiling in confined spaces such as huts, to escape unwanted attention. The consequences of this are extremely dangerous.

In the natural environment, liquid mercury will be gradually absorbed by clay minerals and converted into organic mercurials by micro-organisms. These become concentrated as they pass up the food chain. Poisoning with such organic mercurials is known as Minamata disease, (following an outbreak in Japan). It is characterised by lesions of the central nervous system and symptoms include a progressive weakening of muscles, loss of vision, impairment of the cerebral functions, paralysis, coma and death. In the Japanese case, effluent from a factory contained mercury that was absorbed and concentrated by fish and shellfish. These were eaten by the local inhabitants. Cats and seabirds were also affected.

The amount of mercury lost to the environment at Iluma is impossible to estimate accurately. However, a large number of miners were involved, large quantities of gold were extracted, and mercury was used commonly. Hence, the area of the village and the washing places in the river must exhibit mercury values well above normal background levels. The area is small relative to the size of the proposed Game Reserve. However, the presence of such a toxic substance with such a tendency to concentrate is alarming, especially as the contaminated river supplies water for consumption and fisheries.

It is essential that mercury retorts be introduced and education programmes regarding the dangers of mercury be implemented as soon as possible. The Irish Foreign Service is presently funding a research programme through CSA Africa to evaluate the manufacture and distribution of mercury retorts to small scale miners in Tanzania.

4.5 Management Options for Mining Within the Proposed Game Reserve

(a) Options for Mining the Area

In the future, the management of the area must choose between the three types of mining.

Artisanal mining. Artisanal mining is conducted by village people with rudimentary techniques. It tends to be unsystematic, labour intensive and dangerous. In addition it encourages lawlessness, illegal mining activities, health hazards and environmental destruction. Due to the inefficient methods used, it is very ineffective at recovering gold. It can only deal with: loose rubble and coluvial deposits above the water table; deeply weathered ore that can be hand-dug; and, small rich pockets that justify the extremely hard task of hand mining solid rock. Only a portion of the gold is sold to official dealers. The balance goes to black market traders and fails to contribute to the overall wealth of the country. On the positive side, such mining can provide a cash income for villagers in depressed regions.

Small scale mining. Small scale miners recover gold from small deposits, using appropriate techniques, including some mechanisation. Small or irregular deposits can be worked which would not be economically viable to larger operations. It requires a degree of organisation and capitalisation, but is capable of yielding steady returns. This type of mining can also provide an environment in which workers can learn new skills and become more effective operators. The draft Tanzanian Mining Code makes provision for small scale mining. Those holding prospecting rights can take out exclusive Mining Claims that are surveyed and authorised by Madini. These

give exclusive, legal mining rights to an area. The advantages of this system are that one person is responsible for the mining on his claim and has a clear legal title. Consequently, the safety and protection of the environment are more easily regulated. Similarly, it is easier to regulate the buying of gold and so diminish the amount lost to the black market.

Large scale mining. Large scale mining is normally undertaken by large industrial companies. It requires substantial capital investment, first to locate or acquire the ore body and then to assemble the equipment and personnel to mine it. Due to the long time required before any income is generated this is a high risk business, but one that can return substantial profits if all goes according to plan. A company generally starts operations by taking out one or more Prospecting Licences, which are issued by *Madini* in roughly 50 sq km blocks. These give the holder exclusive rights to look for mineral deposits within the area specified. The Licence is renewable after three years, but during that time the holder must spend a preset amount of money, of the order of US$ 250,000, on work on the licence to keep it in good standing with the Government. If the company finds a suitable deposit it takes out a Mining Licence on a reduced, selected area and relinquishes the rest, which can then be re-examined by others. Modern mining techniques enable the hardest rocks to be mined and can extract the smallest quantities of gold effectively. Hence, mining companies are able to deal with large and difficult ore bodies, that would be quite inaccessible to smaller operators.

Due to central control, large scale mining can be regulated by Government mining authorities and careful auditing can insure that all gold is sold officially. They can be important local employers, with a vested interest in teaching their employees new skills in a wide range of situations. Although the mining industry has a bad reputation as despoilers of the environment, by careful monitoring and imposition of controls, the disturbance can be minimised.

Which of these options can best suit GR management policy? Three factors must be considered:

- *Law enforcement within a GR*. The Wildlife Conservation Act prohibits permanent human settlement, and aims to minimise entrance into the GR via a permitting system (see Planning and Assessment for Wildlife Management in this volume);
- *Disturbance to the environment within a GR*. This must not only produce an undisturbed habitat for wildlife, but must satisfy any other reasons for creating a GR. The proposed Muhesi GR, is a significant part of the catchment for the Mtera Dam, a nationally important source of water and hydroelectric power. It is vital that pollutants, human disease carriers and excessive silt should be prevented from entering the drainage system; and,
- *Cost of maintaining a GR*. This is considerable. As far as possible GRs must become self-supporting.

Of the three types of mining, artisanal is the least satisfactory. It is difficult to monitor and involves large numbers of people. The returns are relatively small and the techniques are inefficient. As no individual or company is responsible it is well nigh impossible to impose environmental controls. The sheer numbers of people mean that the environment will be disturbed and poaching will become a problem. In the past, mining camps have often been the centres of epidemics. Artisanal mining is not provided for under the Tanzanian Mining Code. Hence, it would be wrong for a government or parastatal body in another sector to be seen to be condoning or encouraging an illegal activity.

Small and large scale mining, however, are covered by an appropriate legal framework, which enables them to be formally controlled. Mining practices and environmental protection are both

regulated under this legislation. Furthermore, these regulations are enforceable because only one individual or body has responsibility.

The method that is most suitable depends upon on the nature of the deposit involved. Large, low grade deposits can only be worked effectively by large scale techniques. Small, rich deposits, such as discontinuous veins or pockets of alluvial and eluvial gold, are not suitable for large industrial processes, but can, nonetheless provide an excellent site for small scale mining.

In the case of Iluma Hill, as mentioned above, the possibility of a large tonnage low grade deposit exists. This could be worked by industrial methods, and the implementation of a full exploration evaluation should be encouraged. This programme, however, will be a costly exercise to undertake, even to complete the next phase.

(b) Area set aside for Mining within the Management Plan for the Reserve

The consultants were asked to define an area that could reasonably be considered to contain any likely mineable gold ore adjacent to the presently mined area. This has been done and is illustrated in Figure 3. UTM Grid coordinates for the corners of this area are:

930100N	068650E
930100N	069100E
929700N	069100E
929700N	068800E
929900N	068650E

(c) Provisos for Mining Activities within the Set Aside Area

- all mining operations within the area should be conducted under strict environmental controls, both for the protection of the natural environment and for the protection of human health. At the end of the operation the area must be returned as close as possible to the natural state, through bulldozing all spoil dumps flat and filling any pits or shafts. The regrowth of natural vegetation should also be encouraged by the setting aside and replacement of topsoil; and,

- the Department responsible for the management and protection of the GR should receive a royalty or similar income from the activities.

The first proviso is reasonably straightforward and a plan can be drawn up based on environmental needs and experience elsewhere. The second proviso, however, concerns agencies outside the Department of Wildlife, such as the Department of Mines and the Treasury, and needs to be fully discussed and debated with the appropriate authorities.

(d) Legal and Financial Considerations

A possible framework that might form a basis for the discussion covering the legal and financial aspects is outlined below.

At present, the Wildlife Department exercises controls over commercial activities in GRs, such as hunting, fishing and bee keeping. There appears to be no logical reason why gold mining should not also come into the same category, but the Department needs a legal position from which to deal. It is suggested that the prospecting rights in a Game Reserve should automatically be vested

in the Wildlife Department for administration with the assistance of Madini. The Department can then enter into the equivalent of joint ventures with mining companies for the extraction of gold and other minerals.

It is normal practice where a Prospecting Licence holder does not have the means to develop his own licence area to enter into an agreement with a mining company. This agreement notes that the mining company will undertake all the management and implementation of the project and provide all the capital investment. If they decide to terminate the agreement or are unable to continue for any reason, the title remains in the name of the PL holder, to whom all exploration data and results must be made available. The PL holder may then seek another partner to continue the work if desirable. All the financial risk is borne by the investor in this instance, and so he must expect a substantial part of the reward. The division of the reward is most easily and unambiguously determined as a percentage of the gold recovered regardless of profit. Indeed, the Government of Tanzania receives a 3% Royalty in this way on all gold mined in the country. The normal reward for the PL holder where he takes no risk is also about 3%. The net result is therefore:

- royalty to the Government of Tanzania 3%;
- royalty to the Department of Wildlife, as "PL Holder" 3%; and,
- balance to the miners to cover their capital and other costs and profits 94%.

In the instance of the hypothetical ore body that might occur at Iluma Hill mentioned above, the figures might work out as follows:

- one million tonnes of ore averaging 10 grams Au per tonne will contain 10,000,000 grams of gold;
- at the present gold price of US$ 380 per ounce, the value of gold recovered would be approximately US$ 120 million; and,
- royalty payable to the Department would be US$ 3.6 million.

In addition to these benefits, a good all weather road would be constructed into the GR, and suitable mine office building might be converted to serve the needs of the reserve management. All administration, environmental and management costs would be expected to be borne by the miners and there would have to be substantial financial guarantees to cover the liability of the cost of final environmental restitution. The time frame from exploration to completion of mining might be of the order of five years. Such a system could be adapted to serve either the large scale or small scale mining options.

4.6 Mineral Potential Outside the Iluma Area

(a) Further Mining Potential of the Area

Department of Mines records mention the alluvial gold potential of the Kisigo River (Wade *et al.* 1938) from its mouth at the Njombe River to fifty-four miles upstream, an area outside the proposed Muhesi GR. The occurrences were interesting but unlikely to lead to economic quantities of gold, due to the lack of reworking in the area and the simple erosion history.

The tributary of the Kisigo that transects the Iluma mining area follows the general direction of the shear zone to the west, and is fed by small tributaries draining the area underlain by the shear. Since the shear is a focus for mineralisation, it is likely that these streams contribute gold to the sediments of the river, although the presence of a younger granite, as at Iluma, is an important

factor in controlling the overall abundance of gold. The alluvials are probably not rich, and do not offer a very attractive target for large scale mining. They might be tackled by small scale miners, but the need for pumping and excavating equipment might put them beyond small miners' means.

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References

Planning and Assessment for Wildlife Management (This volume). *Wildlife legislation as it relates to mining in protected areas*.

Saggerson, EP and Turner, LM (1980). Distribution of regional metamorphism in East Africa. Geol Rdsch. 69, 3; 745-756; Stuttgart.

Stockley, GM (1948). The Geology and Mineral Resources of Tanganyika Territory. *Geological Survey of Tanganyika, Bulletin* 20: 1-37.

Wade, FB. and Oates, F (1938). An explanation of Degree Sheet No.52, Dodoma. *Geological Survey of Tanganyika, Short Paper* 17: 1-60.

RECOMMENDATIONS

The workshop agreed to the following recommendations.

- The mining zones in Muhesi Game Reserve should be defined immediately, according to the work already completed by CSA Africa. This zoning should aim at incorporating mining activities in to the GR and that the area not be annexed from the GR.
- The Department of Mineral Resources should issue mineral rights to organised and legal small, medium or large scale mining companies. The mining company(s) will be responsible for the rehabilitation of the area on vacation, upon which time the zone will return to the GR.
- No artisanal mining activity will be permitted in the area. Artisinal miners should be encouraged to form co-operative societies which may be granted mineral rights in the area.
- Before any further mining takes place, an Environmental Impact Assessment by an independent party must be conducted.
- Parts of the proceeds from mining should go to the Wildlife Department, Local District Council and the Department of Mineral Resources. However, the details still need to be worked out between the respective authorities and the mining company(s).
- The two Ministries: Tourism, Natural Resources and Environment; and Water, Energy and Minerals, should take immediate action to bring the Wildlife and Mining Laws into agreement. The newly formed laws must be in conformity with environmental sector standards.

Based on workshop discussions, the Policy for Wildlife Conservation and Utilisation (Department of Wildlife 1995) incorporated the following statements with regard to mining:

Mining in Protected Areas

Tanzania is well endowed with mineral resources, and a number of existing and intended PAs contain mineral resources of considerable value, including base metals, precious metals and gemstones. The Mining Act gives the Commissioner of Mineral Resources the right to issue mineral rights in particular areas. However, the Mining Act does not allow the registered holder of a mineral right to exercise any of his rights under his license or under the Mining Act in any NP, GR, NCA or FR without the written consent of the authority having control over the land. Government recognises that it wishes to promote integrated development of Tanzania's natural resources in such a way as to maximise earnings while upholding the principles of conservation. Accordingly, Government will adopt the following principles in relation to mining within PAs devoted to wildlife conservation:

No mining in National Parks or Ngorongoro: It is Government policy not to allow any mining in NPs or in the NCA in view of their outstanding wildlife, scenic and conservation values. Legislation relating to these areas will be reviewed to remove any anomalies between the stipulations of the Mining Act and of the National Parks and Ngorongoro Conservation Area Ordinances.

Strict conditions for mining in Game Reserves: The Director of Wildlife will give consideration to the undertaking of mining for precious metals and gemstones in GRs. In order to comply with the respective policies and legislations of both wildlife and mining sectors, the Director of Wildlife will only agree to the exercising of a mineral right by a large or small scale mining firm

which will extract the mineral efficiently and with minimal pollution and limited environmental damage. All mining will be conducted in a specified zone within the GR and those entering the GR to exercise a mineral right will require permits for entry. All mining operations will be preceded by an Environmental Impact Assessment which will require an assessment of restorative measures that will be taken to return the mining zone to back to its natural state upon cessation of the mining operations. The uncontrolled mining of a GR by artisans will not be allowed, either under wildlife policy which requires restricted entry and only licensed cutting of vegetation in GRs, or by current mining policies which discourage artisinal mining because it does not maximise economic returns to Tanzania.

Reference

Department of Wildlife (1995). *Policy for Wildlife Conservation and Utilisation*. Dar es Salaam: Department of Wildlife.

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Mining in Protected Areas in Tanzania

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Related Publications

The following related reports have been published in the Species Conservation series by IUCN - The World Conservation Union: Gland, Switzerland; and Cambridge, UK.

Community-based Conservation in Tanzania. Edited by N.Leader-Williams, J.A. Kayera and G.L.Overton. 1996.

Tourist Hunting in Tanzania. Edited by N.Leader-Williams, J.A. Kayera and G.L.Overton. 1996.

The Live Bird Trade in Tanzania. Edited by N.Leader-Williams and R.K.Tibanyenda. 1996.

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