AFRICAN MINING PARTNERSHIP

PROJECT ON

IDENTIFYING THE ROLES OF LOCAL COMMUNITIES INCLUDING WOMEN AND CHILD LABOUR IN THE DEVELOPMENT OF ARTISANAL AND SMALL SCALE MINING IN AFRICAN

Prepared by: Nigeria, Mali and Ethiopia

Report Submitted to the Honourable Minister Federal Ministry of Solid Minerals Development Abuja

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Executive Summary

- On the request of the Honourable Minister, Federal Ministry of Solid Minerals Development, a study was undertaken to evaluate the roles of local communities including women and child labour in the development of artisanal and small-scale mining in Africa.
- A comprehensive bibliographic compilation of over seventy-five contributions demonstrate that mining and mineral-based activities are prominent, and hence have substantial socio-economic implications in most rural African communities.
- The assessment of the distribution, operational conditions, organizational set-ups and facilities of representative mining communities in Nigeria as case location for the continent, was carried out, through field surveys involving the administering of questionnaire and interviews.
- Notable examples of mining activities include mining and processing of mineral raw materials, such as tin, columbite, tantalite, gold, marble, clays, salts and gravels. These for example, support the making of pottery, cosmetics, absorbents, refractories, building and construction materials, plus melting and alloying for example gold, brass and bronze.
- Most of the operations normally involve the use of cheap women and child labour, particularly at the down-stream segment. Besides, substantial number of foreigners emigrate into the country for participation in the enterprises.
- Labour intensive simple tools are commonly employed in the various types and stages of the projects.
- The major sources of investment funds are mostly from the individuals, and at times remittances from relations outside the country.
- The revenues and returns from the operations, are generally inadequate to sustain acceptable minimum living conditions.
- Notable socio-economic implications of the undertakings include increase in child abuse, lawlessness, crimes, promiscuity and incidences of sexually transmitted diseases. Besides, high cost of agricultural products is prevalent.
- In addition, some adverse environmental and health effects are land despoilation, vegetation degradation, air and water pollution, respiratory tract diseases, cholera and diarrhoea.
- Undoubtedly, for improved efficiency and productivity, there is the need for sustainable development of the mining industry in Africa, through provision of adequate supervision, regulation, training, empowerment, funding, mechanization, infrastructures and health facilities.
- The sustainable growth of the minerals industry likewise demand the operation of an African network for collaboration, exchange and utilization of mineral finds from artisanal and small-scale mining projects.

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31 January, 2005

Introduction

Preamble

Africa is obviously one of the continents most richly endowed in human and material resources, vividly reflecting its enormous geo-diversity and plurality in ethnicity. However, all the African countries (Fig. 1), from the viewpoint of socio-economic status, are developing nations with the majority of the populations dwelling in rural areas characterized by peasant living conditions. Consequently, a high percentage of Africans still earn their living from tilling or harnessing the land in agriculture and mining.

As a matter of fact, mining and mineral-based projects are known to be age-long in most African communities. For instance, the earliest local ventures notably include the exploitation of raw materials like laterites in building bricks, clays for pottery, crystalline rocks in producing grinding stones and wares and brines for salts extraction. Others are the making of mineral-based pipes, beads, medicinals, coatings, decoratives, cosmetics, ornamentals and additives, plus the fabrication of brass, bronze and steel items. These enterprises obviously demonstrate the evolution and availability of indigenous African expertise in mining, mineral processing and metallurgy.

Incidentally, African nations have generally shown not much awareness and interest in evolving long-term policies, strategies and collaboration in sustainable development and utilization, and hence monetizing the values of mineral resources. On the other hand, the minerals industry has significant impact on the political stability of several nations in Africa. For instance, the funding of crises, conflicts and wars are through the sale of conflict or "blood" minerals, notably diamond in some countries.

Roles of African Women and Children

Historically, women are not only tasked with the responsibilities of childbearing and upbringing, but as traditional breadwinners, they and their kids are involved in all kinds of business. As expected, agriculture and agro-based projects, mining and mineral-based undertakings are the major areas of employment for women and children.

It is however pertinent to note that the general lack of formal training and education encourages the engagement of women and children as cheap labour in the local mining industry. Besides, the prevailing situation of the thriving of child abuse and women trafficking, coupled with the lack of extension services for mineral development, despite the growing role of informal gemstone exploitation in Africa, emphasizes the vulnerability of such communities to various occupational, sociological, environmental and health hazards.

Commissioning of this Project

The Federal Ministry of Solid Mineral Development, Abuja, Nigeria, in actualizing its vision, mission and mandate for sustainable growth of the relevant industrial sector, has found the need of collaborating with various national and international agencies including the African Mining Partnership (AMP). A notable fall out of the relevant initiatives is the acceptance of the proposal submitted in October, 2004, by the Research Team, Department of Geology, University of Ibadan, Ibadan, on "Identifying the roles of local communities including women and child labour in the development of artisanal and small-scale mining in Africa". The offer was communicated by the letters of the Honourable Minister, dated 25th November, 2004 and 13th

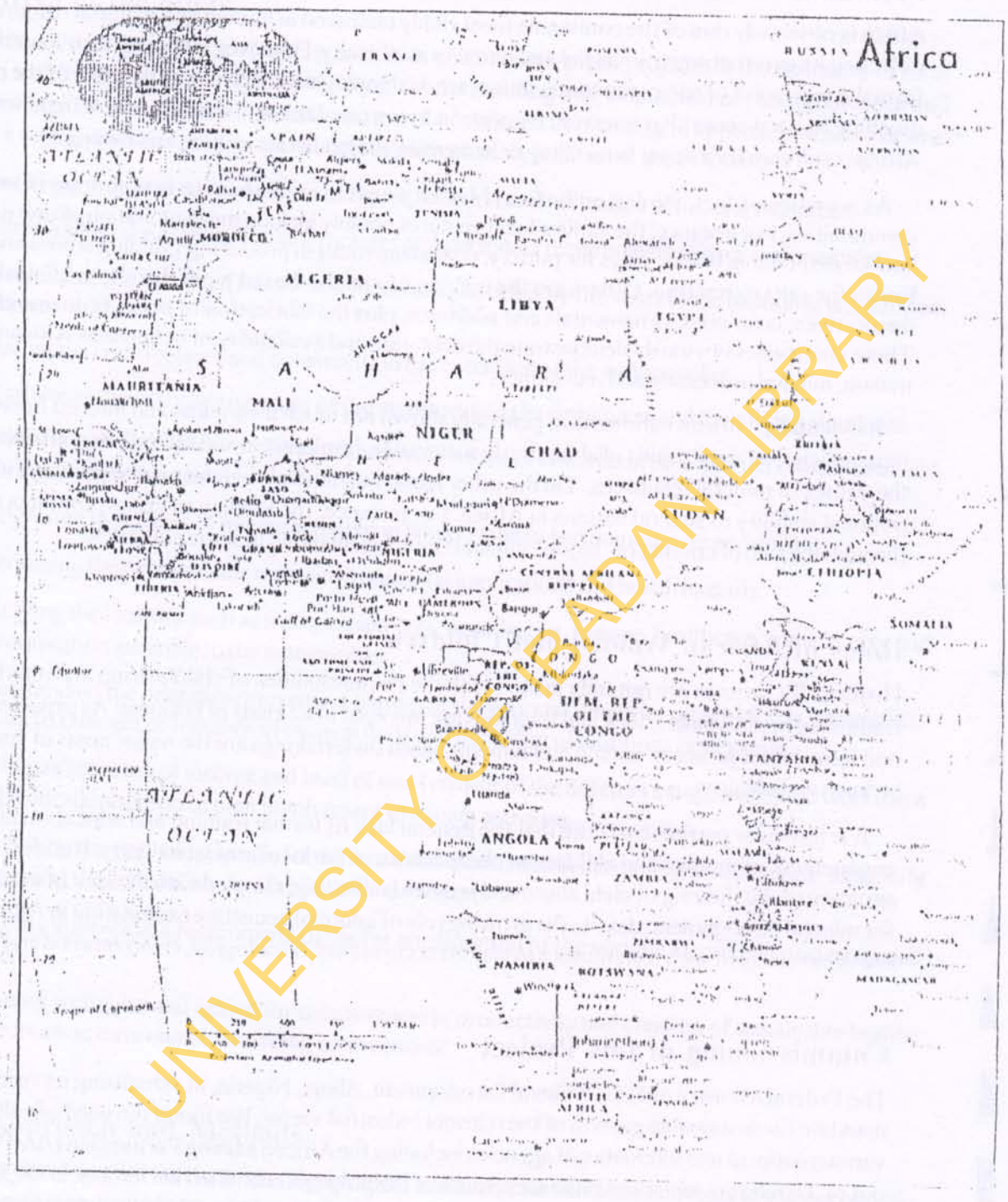


Fig. 1. Plan showing the countries of Africa, and in the insert its disposition relative to the other continents of the world

December, 2004, correspondingly with the reference numbers MSM/ME&P/OP/018/S.i/6/V.I and MSMD/MN/C.0418 A/47.

Objectives of the Study

In the view of the significance of mining activities and mineral-based projects in the economy of rural dwellers in Africa, there is need for a thorough understanding and evaluation of the significance and implications of the roles of communities, women and children. A meaningful approach would likewise demand a multidisciplinary scope, and hence the current study is aimed at the following:

- Identifying project areas and nature of the exploitation and utilization of mineral resources.
- Understanding the organizational structures and personnel requirements of such undertakings.
- Determining the nature of labour and functions provided by the workforce including women and children.
- Isolating the contributions and constraints in the execution of the various roles.
- Ascertaining the derivable incomes of the investors and the employees and their living standards.
- Establishing the cumulative effects of the involvement of children in their overall educational and sociological development.
- Recognizing the effects of mining activities in family stability and domestic responsibilities.
- Determining the occupational risks, environmental implications and health hazards.
- Identifying the facilities such as tools, implements, machineries, finance, healthcare, water supply and communication available to the communities.
- Understanding the migration/movement pattern of the various categories of workforce, especially in relation to changes of fortunes of mineral finds and depletion of workings or deposits.
- Isolating other areas of income and level of involvement of the different categories of the workforce and the duration/season of their involvement in mining activities.
- Establishing the prevailing level of orderliness and lawfulness in the mining communities, especially recognizing the areas of abuse of children and women.
- Providing appropriate recommendations for amelioration of the various identified constraints and problems.
- Designing strategies and option for enhancement in productivity and creation of sustainable healthy socioeconomic environment in mining communities.

Scope, Approach and Methods

Firstly, it pertinent to note that in terms of geological attributes, human perspectives and socioeconomic indicies, Nigeria is particularly appropriate as the main case location for the relevant investigation. Therefore, the work plan adopted for effective execution of the assignment is as outlined below.

- Compiling available literature and materials on small-scale/artisanal mining in Africa and some other

developing countries, including acquisition of information from relevant non-governmental organizations (NGOs), Government agencies such as Local Governments, Departments of Women and Youths, Mines and Geological Survey, Federal and State Ministries and parastatals.

- Delineating known localities within the geological zones of Nigeria in which mining activities and mineral processing ventures are in operation.
- Designing appropriate questionnaire for the acquisition of relevant data on the various aspects of the work (Appendix 1).
- Carrying out detailed field surveys incorporating appropriate informal strategies to facilitate the obtaining of the necessary information and data from the expected respondents.
- Extending assessment, particularly through literature on case locations in other African countries, to enhance database and projection.
- Analyses of data and report writing, with adequate provision for appropriate recommendations, strategies and options.

The literature work and sourcing of materials likewise entailed the acquisition or use of appropriate location maps, geological maps and atlases, and afforded the compilation of the detailed bibliography of the report.

As for the field exercise and survey, concerted efforts were make to adequately cover the major geopolitical zones of Nigeria. It was also ensured that the major categories of mineral-based projects based on geological setting, commodity type, scope and operational set-up, were adequately covered in this study. Necessary geological assessments and measurements and geo-referencing were likewise undertaken by the field officers and personnel.

Geological Setting and Mineral Resources of Africa

Precambrian Terrains

Africa is composed of highly deformed metamorphic rocks and granitic intrusions often referred to as the basement complex. This forms the ground surface over half of the total area of Africa. In the other half, the basement is overlain by relatively thin layers of nearly flat lying sedimentary rocks, which occupy broad shallow basins (Fig. 2). The basement complex is older than 500million years (500 Ma), that is, they are mostly Precambrian, while most of the sedimentary rocks are younger than about 600 Ma; that is they are mainly of Palaeozoic and Mesozoic to Tertiary age. The metamorphic and intrusive rocks that form most Africa are the products of various events of intense deformation, regional metamorphism and partial melting; the last being the Pan-African (ca.600Ma).

There is generally some overlap of ages between these two main groups of rocks. In northwestern Africa, for example, some of the sediments of the Taoudeni and Volta Basins are of late Precambrian age, and some of the metamorphic rocks in Mauritania and Senegal are Palaeozoic. The sediments in the basins are occasionally strongly folded. The best-known example is perhaps the Benue Trough of Nigeria (Fig. 2). Africa is predominantly a continent of plains and plateaux and intervening escarpments, the result of erosion and denudation lasting many hundreds of millions of years. Topographic relief is low over vast areas. Slopes are steep, commonly in regions where doming and major rifting have occurred, especially in eastern Africa. In the African continent, there is a correlation between the occurrence of economic mineral deposits and the age of the rocks. The rock associations appropriate to various economic mineral deposits occur in many places. For example, major deposits of diamond, gold, chromite and iron ores occur in cratonic areas of Archaean to lower Proterozoic (Precambrian) age, such as the Kalahari craton, whereas important copper, tin, lead and zinc ores are more commonly found in younger rocks.

The geology and mineral resources of Nigeria (Fig. 3) are essentially replicas of what obtain in the whole of the African continent. Three major rock units, namely, the ancient gneiss-migmatite complex, the schist belts and the Pan-African intrusive series, are recognized in the Nigerian sector or basement complex of the Benin-Nigerian shield (Fig. 2). The schist belts which are composed mostly of metasedimentary plus mafic-ultramafic bodies, occur mainly in the western part. They are generally related to prominent fractures, variably considered as shear zones, thrusts, nappes and crustal sutures (Olade and Elueze, 1979; Ajibade and Wright, 1989). These are viable sites for ore mineralization.

The Pan-African intrusives are dominantly of granitic composition. These include porphyritic granites, fine and medium grained granites, granodiorites and quartz diorites. Closely related to these, are basic rocks, charnockitic masses and dolerite dykes. Many of these intrusives, most especially granites and pegmatites are enriched in gemstones and rare metals such as tin, tungsten, niobium and tantalum.

The Younger Granites, particularly in Nigeria and Niger, are known for tin mineralization. However, most of Nigeria's tin and columbite productions come from alluvial concentrations around Jos. Wolframite, topaz, fluorite and sulphides, notably sphalerite, chalcopyrite, pyrite and molybdenite are also found in primary veins. Gem quality crystals of beryl, aquamarine and even emeralds are present in the Younger Granites. Other minerals found in alluvial concentrations, include magnetite, ilmenite, zircon, thorite and monazite, which are currently not of economic interest, but could prove to be useful in future.

The Cenozoic volcanics are used as crushed rock for aggregates and road building. Placer and residual deposits, such as gold, clays, laterites and bauxites are often the result of Tertiary-Quaternary weathering

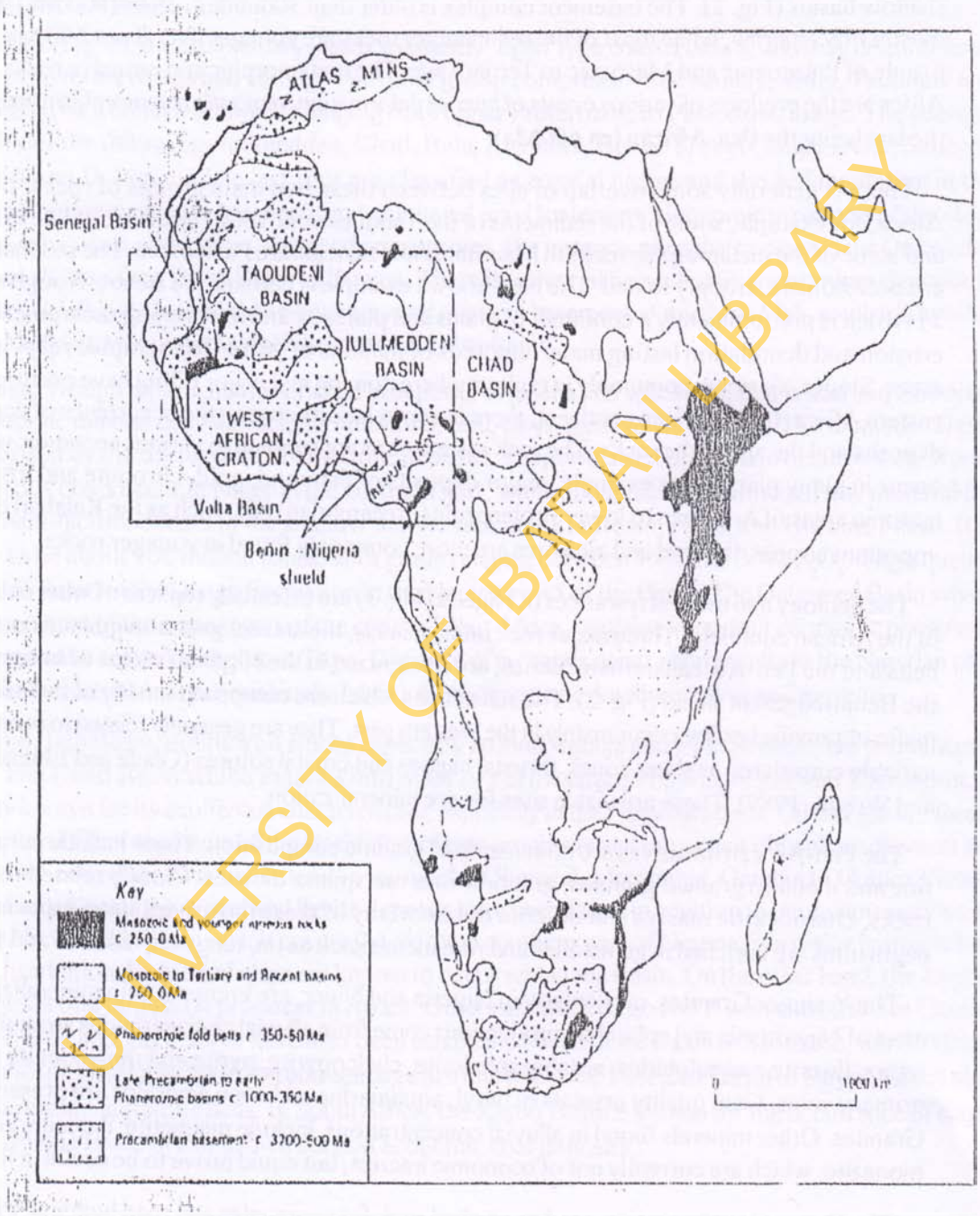


Fig. 2. Generalised geological map depicting main rock and age domains in Africa

and erosion under tropical conditions, while some are often small in size and not suitable for large-scale mining enterprises. Weathered basaltic volcanics of the Jos plateau produces clay that have potential for brick and ceramics manufacture. Deep weathering of basaltic volcanics in Adamawa region of Cameroon produced bauxite deposit estimated to contain over a billion tones of ore. Laterites that are developed from basement rocks are usually adequate for road construction.

Sedimentary Basins

In West Africa (Fig. 2), the sedimentary basins are mostly 'open' type coastal basins, and may be considered in two parts; in terms of age and setting. The older group comprises three namely; Volta, Taoudeni and Bove Basins, which contain sediments ranging from upper Proterozoic to Palaeozoic in age. The younger group includes the following- Iullmedden, Chad, Bida, Anambra, Benue Trough, Niger Delta, Senegal, Ivory Coast and Dahomey. The last four are classified as coastal basins and the sedimentation in the younger basins commenced in Mesozoic and continued into Quaternary. Economic prospects of the older basins include bauxites, phosphates, clays and uranium ores. For instance, phosphate occurs in the Ordovician and Silurian shales of the Bove Basin in Guinea. There is potential for sedimentary uranium deposits in southwestern Mali, gold in both the sedimentary and adjacent basement of southern Mali, south of Bamako and in the Voltaian, where occasional diamonds are also found.

The Benue Trough is particularly enriched in deposits of galena and sphalerite, that is lead and zinc ores. Other economic mineral deposits include limestone, coal, clays, glass sands and salt. The Illumeden Basin is characterised by the occurrence of limestone deposits, evaporites and phosphate occurrences. Some Carboniferous coals occur in Niger in the northern part, while phosphate, the principal raw material for fertilizer manufacture occurs in the shallow marine sediments in Benin, Niger and Burkina Fasso. It is estimated to be about 100 million tones, with grade ranging between 15% and 30% P_2O_5. High quality kaolin is also found in the Dange Formation in the Nigerian part of the Basin. The Dahomey Basin which extends over most of the eastern part of the coast of West Africa, contains important economic phosphate deposits especially around Hahotoe in Togo. Deposits of tar sands occur prominently in the Nigerian part of the Basin. Industrial minerals within the basin include limestone, kaolinitic clays and gypsum.

As for the Bida Basin, oolitic iron stones especially around Agbaja and Lokoja areas, are prominently exposed. The Chad Basin which extends into most of northeastern Nigeria, Niger and Cameroon, is particularly known for its aquiferous characteristics, especially in the Nigerian sector. Oil and gas are found in the Niger and Chad segments of the Basin. Petroleum prospects and important phosphate deposits are known in the Senegal Basin which extends over much of Senegal, Mauritania, Gambia to Guinea Bissau. As for the Ivory Coast Basin, coal and lignite deposits have been found in addition to bituminous sands and clays. The Niger Delta Basin which covers the extreme southern part of Nigeria, is a major hydrocarbon province. In addition, lignite and clays are known to occur within the Basin. On the other hand, the Angola Basin is the second largest oil producer in Africa. Others are the Congo and Kwanzam basins in Central Africa. Some oil and gas reserve have also been established in Essaura Basin in Morocco, north Africa. Besides, phosphorites and hydrocarbon seepage are known in the East Zeit Basin in Egypt, which also contains important limestone beds. In South Africa, the Karoo Basin is known for the occurrence of clays, while the Wankie Basin of Zimbabwe contain economic coal deposits.

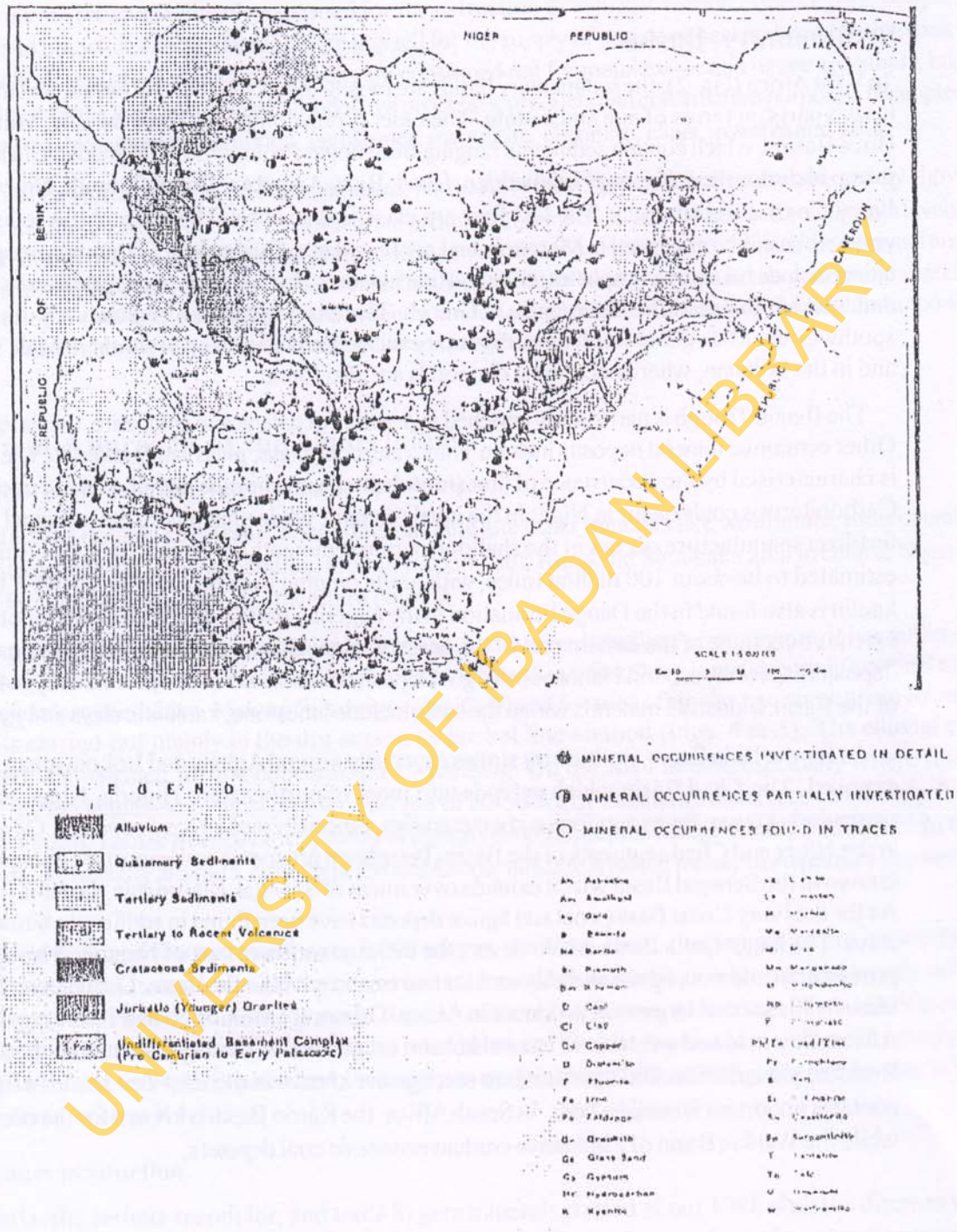


Fig. 3. Geological and mineral map of Nigeria (J.J. Nchikhare, Director, Geological Survey of Nigeria, 1987)

Rural Mining and Mineral-Based Projects

Categorization of Mineral Resources

On the basis of the mode or style of utilization and application, mineral resources are often grouped into ore or metalliferous deposits, energy sources, industrial or non-metallic minerals and even water supplies. Ore minerals are those specifically exploited for the extraction of valuable metals, such as gold, copper, lead, zinc and tin; while energy resources are utilized for the supply of power or heat and combustive fuels. Non-metallic or industrial minerals and rocks are consumed not for metal extraction or energy supply, but mostly as ingredients and raw materials in industrial processes, products and construction purposes. Examples include marble, talc, gypsum, diamond, gemstones, magnesite, chromite, clays, granites and salts.

Available literature, records and field evidences, particularly from Nigeria as case example, vividly show that in Africa, these various mineral resources, are prominently exploited at artisanal and small-scale levels. Table 1 illustrates the main categories of projects in the minerals industry. However, due to the informal and at times haphazard approach, artisanal and small scale operations hardly engage in the systematic search or exploration for minerals deposits. Consequently, undertakings in the upstream or the first and second stages of Table 1, hardly attract the interest of these categories of operators.

Scope and Approach of the Undertakings

Production of rare metals (tin, niobium, tantalum)

Rare metal ores notably cassiterite, columbite, tantalite and other minerals like wolframite, molybdenite and thorite usually occur in association, around Barkin Ladi, Kano and Saminaka area in central Nigeria and Olode and Komu areas of southwestern Nigeria.

Mining used to be on a large scale in these areas, but due to dwindling price regime, it has suffered relative neglect. However, with recent marginal improvement in price, there is resurgence in artisanal and small scale mining activities. Males of between ages 12-40 and females of similar age range are involved. Mining is carried out mainly in the dry season by bucket line method (Figs. 4 & 5). The elluvial are excavated, and washed for the concentrates by panning. On the Jos Plateau, especially where these artisanal mining activities are most prolific, average of 20-500kg of cassiterite ore is recovered daily. Due to the haphazard nature of excavation, many of the pits do collapse, resulting in many casualities. In the southwest, particularly around Komu, Sepeteri and Olode, tantalite is mined mainly from primary pegmatite veins.

A typical mining site may record over 5,000 miners at a time. Here, the pegmatite ore is chiselled, blasted, crushed and washed to win the concentrates. A crude, but nearly accurate method locally called "burreting" is used to determine the grade of the concentrate. In this case, a burette is filled with 50cm^3 of petrol, and a known weight of concentrate is poured into it. The displacement in volume is noted and plotted on a volume displacement chart. Average recovery is about 200 to 300kg per site per day in the prolific areas, such as Komu.

Gemstones production

In Nigeria, the serious search for, and trade in gem minerals started about 1988 with the discovery of sapphire in Jemma area, north central Nigeria. Since then, prolific prospecting for and mining of gemstones

Table 1. Layout of main sub-groups and operations in the mineral-based industry (Elueze, 1988)

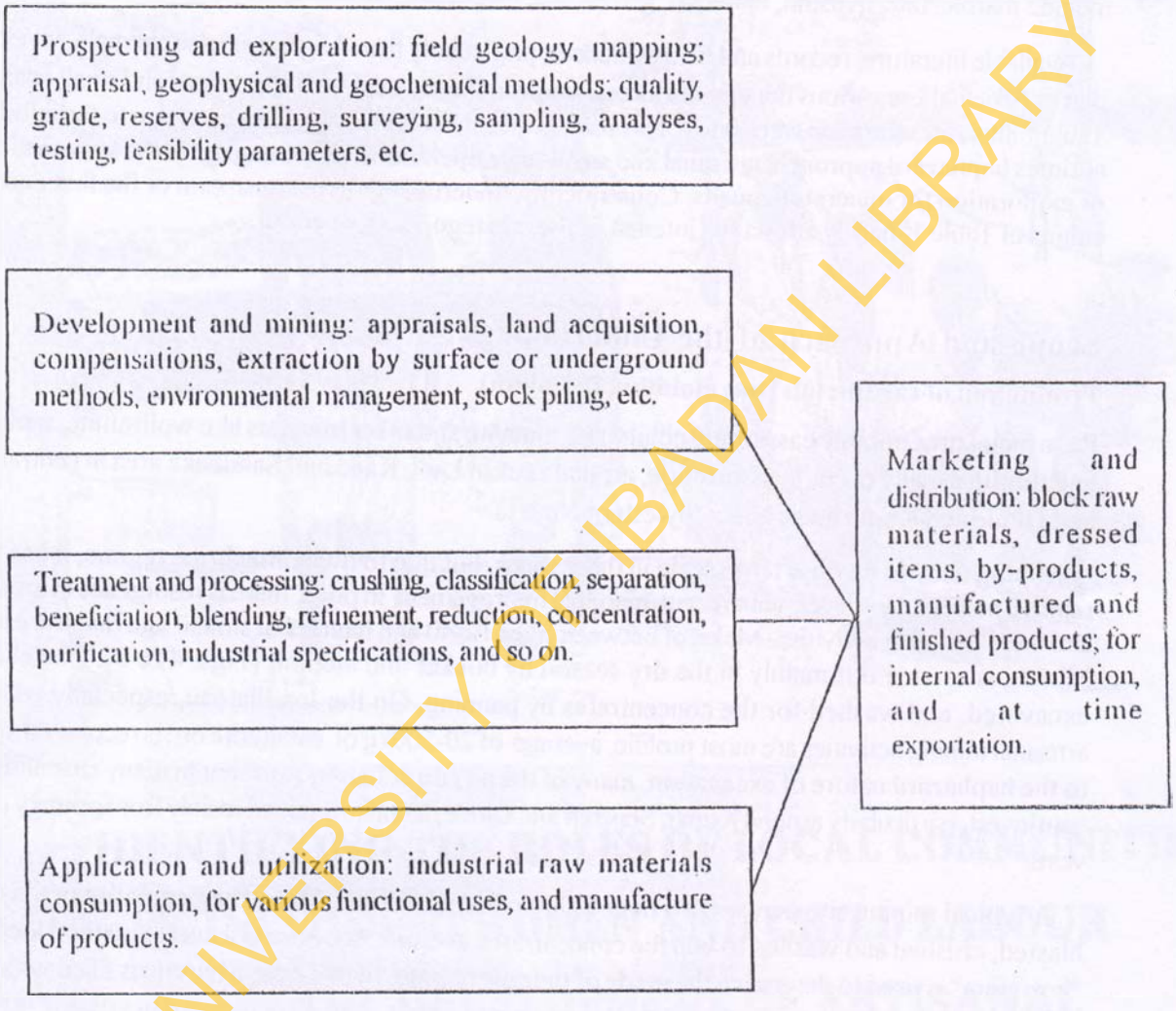


Fig. 4. Typical artisanal cassiterite (tin) mining method in Jos area, central Nigeria

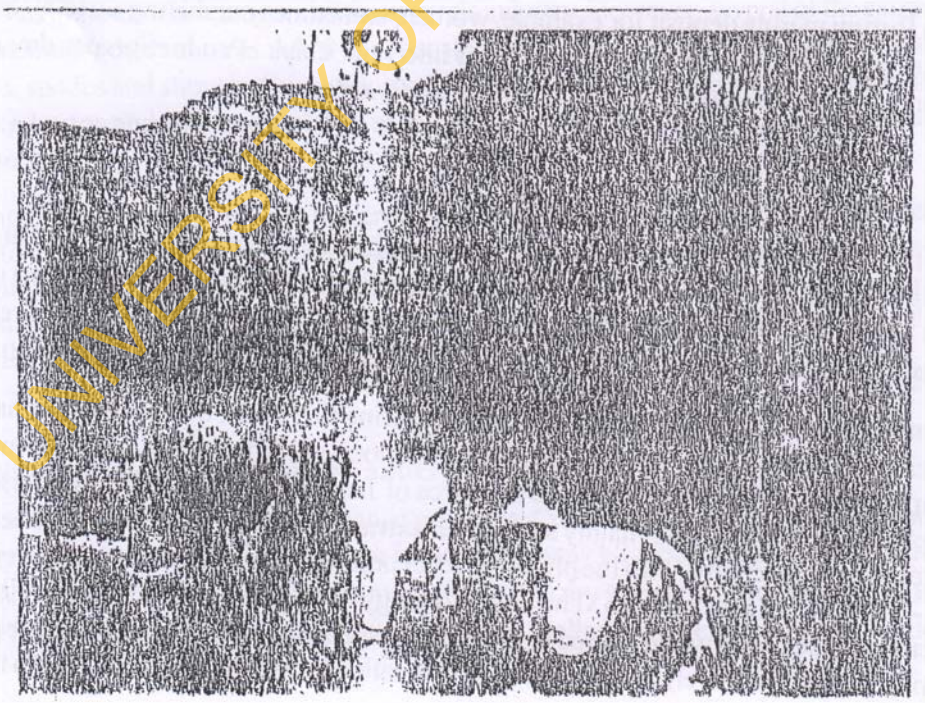


Fig. 5. Example of women involvement in recovery of tin in Jos area, central Nigeria

of various kinds have been on the increase, leading to the discovery of many other occurrences. The relatively low cost of recovery and profitability of trade in the minerals, have attracted a large number of artisanal and informal miners. Although accurate figures of recovery is not known, but an output of over 20 tons of different varieties over the last decade is estimated.

Prominent localities of gemstone mining include Ikire, Ofiki, Igbojaye, Komu in the southwest, Jos, Dass, Bauchi in the north central, while Kushaka and Anka are prominent locations in the northwest. Common varieties mined include the groups and varieties in parentheses, namely; corundum (sapphire, ruby), beryl (aquamarine, emerald), tourmaline (blue, pink, rubbelite), and zircon.

In most of these locations, mainly men and to a lesser extent young girls of ages 18-24 are involved in mining in a disordered and haphazard manner, which involves excavation and search for disaggregated gem crystals in the alluvial. Recovery is sometimes high, for example in Olode area, southwest Nigeria, approximately 3000kg of aquamarine of different grades was mined between 1991 and 2000, though the top-grade accounted for only about 125kg. This top most grade is valued at N250, 000.000.00. The price of gemstones depends largely on colour, clarity and size. Aquamarine of gem grade is between 500 and ₦4000/gm, while tourmaline price ranges from 400 to ₦2,500/gm. Garnet sells for between 300 and ₦5000/gm. Other semi-precious varieties like amethyst (250-N500), zircon (100–N500/gm) and topaz (10–N20/gm) attract fairly low prices.

Projects in marble production

Precambrian marble deposits occur notably around Jakura, Obajana, Burum and Mopa, (central), and Ukpilla and Ubo (south-south, Nigeria). Others are Igbetti, Alaguntan in the southwest, and Kurakuti in the northwest. Mining of marble deposits is comparatively more controlled. This may be due to the fact that most of the marble sites are owned by companies with better organizational set-up. Mining is usually semi mechanized and the marble is blasted, excavated, transported and dumped at designated points. Women and young girls of 10-20 years are mostly involved in chiselling into finer chips.

In Burum marble deposit for example, women, sometimes numbering up to 50 are engaged, using the bigger sized boulders to break the samples into finer chips. Production per day is sometimes up to 3 trucks, with maximum output particularly in the dry season.

Salt mining and processing ventures

A number of saline springs and lakes occur at localities in southeastern Nigeria. These are Awgu, south of Enugu, Ameki and Ikwo near Abakaliki. Other localities include Okposi and Uburu near Afikpo. There are also similar lakes at Awe and Keana near Lafia in central Nigeria. Recently, the presence of brine around Ogoja in the south-south, has attracted considerable numbers of local processor to the area.

In all the locations, especially those visited during this study, the existence of saline springs, ponds or lakes has given rise to the thriving of (village level) local salt industries. Production involves simple open pot evaporation process, using firewood as source of heat. In this case, large open vessels lined with fire clay bricks are fired with coal, mainly salt is then extracted by the evaporation process. Women are mostly involved in this activity. With the present level of processing, maximum production per day is usually about 30 - 40kg of salt per location. The cost of energy is high, especially with the rising price of kerosene. Increased use of fire wood has led to forest depletion in most of the processing centres. The present level of production is relatively low, and also can only satisfy local demands, especially in the immediate vicinities.

Since the edibility and suitability of the salt for food additives and conditioners, are not in doubt, the empowerment of the local women processors in terms of the availability of capital, modern heating/drying ovems and more efficient processing methods, should be embarked upon

Projects in crushed stones and construction materials

In Nigeria, the major raw materials employed in building and construction projects are geomaterials comprising crushed rocks,chips, gravels, sands and other fragments to which binding items are added to produce various aggregates and mixtures. Crystalline units that yield good rock chips and fragments, are found in much of southwestern, excluding much of the coastal belt and the alluvial zones along the Niger River valley, the southeastern and extreme eastern flanks covering the Oban massif and the bulk of Adamawa and Sarduna provinces and central northern Nigeria. The main rocks mined, comprise basalts, gabbros, granites, gneisses, charnockites, pegmatites, syenites and schists.

In many of the areas visited during the survey, namely Lokoja, Suleja and Abuja (central) Malali, Kaduna (northwest) and Abeokuta (southwestern Nigeria), most of the artisanal operators use crude methods such as direct heating over night (using firewood) and cooling. The effects are the introduction of cracks and spliting of the outcrops. Chiselling and hammering are done to disaggregate and break the boulders into small pieces.(Fig. 6) The production is about 3-4 lorry loads of chips/day. In some areas, where the degree of weathering and disintegration is high, there can be better yield of 6-8 lorry loads per day. The output is also dependent on the number of miners. Usually young men of ages 20-30 are able to produce more, than where women are engaged. In bigger excavation like in Malali around Kaduna, about 50 - 60 men are involved, with lesser number of women. The stress on the miners is always very obvious and they are quite often fatigued, because of the strenuous nature of the operations..

Mining of sand and gravel deposits

With the prevailing boom in the construction industry, especially around the Federal and State capitals, tremendous impetus has gone into this category of the minerals industry. However, several of the extractions are still carried out as small-scale ventures. Most small-scale mines are single unit open pits, using simple implements like hoes, spades and shovels. Currently, many of the dried canals and reclaimed areas around the coastal cities like Lagos and Epe and Calabar in the southwest and south-south, respectively, are targeted by the diggers.

Small scale mining of sands and gravel has triggered off serious erosional and flooding problems, with the adverse consequences on the environment in theses areas. At present, women and teenage boys are engaged in the digging and piling of sands and the gravels. Production depends on the number of people involved, which could range from about 5 to 50 persons in some locations. In the Epe area, about 6000 diggers are engaged in about 35 different sand and gravel mining sites.

Production of clays for pottery, bricks and ceramics

Clays are the main raw materials for bricks and ceramic products. Currently, local small scale brick making concerns involving young men, boys and women are common in many Nigerian villages. Local kilns built with clays are utilized, where small moulded bricks made during the dry season are arranged into stacks of about 20. They are fired over night using wood stacks that are fuelled with kerosene or saw dust. The

bricks are usually tough, but do sometimes crack. They have been found however, to be durable and attract considerable local patronage. Weekly production ranges from about 280 to 350 bricks. The present constraint is mainly the high cost of fuel. Energy demands raise cost of production and discourages the miners and moulders from increasing production.

Local clay mining and processing centres supplying materials for pottery production and ceramics manufacture, are also wide spread in Nigeria, notably in Isan, Imope, Iwo and Abeokuta in the southwest, Suleja and Kujama in the north-central and Yola in the northeast. While clay is the main raw material, other additives are utilized as glaze before firing to produce hard non-porous and durable objects. Women are mostly involved in these ventures including the processing and marketing (Fig. 7). On the average, 55 ceramics pots are produced daily in Imope and 30 in Suleja. About 20 - 30 women are employed in each of these locations.

Project in base metals mining (lead and zinc)

Galena and sphaterite mineralization occur around Ishiagu through Abakaliki to Arufu in southern Nigeria and Zurak and Bodinga in central Nigeria. They are also being won from Enyingba, Ameri and Ameki lodes of Abakaliki area. Artisanal mining mostly thrives at Ameri, Arufu and Zurak areas in the southeast. This involves sometimes up to 600 miners in each location. Miners are of mixed sexes and ages, but mainly between 10 - 60 years. Women too are actively involved in the digging. Mining is usually open cast and in trenches which often follows the trends of the veins.

Arising from the multi-orientation and commonly disseminated nature of the veins, mining is haphazard and dangerous, leaving many open pits, trenches and uncovered shafts. Recovery from the mines ranges from between 1 to 2 tons per location, but could be higher depending on the reserves.

Gold production ventures

The Ilesha area in southwestern Nigeria, is well known for the concentration of gold mining activity. Other notable gold fields include Egbe - Isanlu and Minna (north-central), Birnin Gwari, Yauri, Anka and Maru in the northwest. In the northwest alone, there are about 21 sites of gold occurrence.

These gold deposits are currently being worked by informal miners. Districts visited in this study, include the Birnin Gwari area (Fig. 8). In areas of primary mineralization, mining usually involves blasting of the quartz veins, crushing in mortars to very fine grain sizes for liberation, and washing using sluice boxes. Concentrates recovered are stored in small plastic containers as raw gold.

About 5000 miners are involved. They are scattered in about 6 different overcrowded camps across the Sofon Birnin Gwari area. They include males (10 - 60 years old) who are involved in breaking and crushing of the quartz reefs and females usually from 12 - 45 years of age, who are involved in washing and panning. The alluvial mining which is more common around Ilesha and Ososo areas, involves pitting and washing of the dug out sediments. Mining in both areas peaks during the west season, because of the availability of water. Recovery can sometimes range between 10 and 20 ounces / day per, depending on the population of the workers. Again, indiscriminate digging and uncontrolled trenching have rendered the mining procedures very hazardous, and many accidents have been recorded.

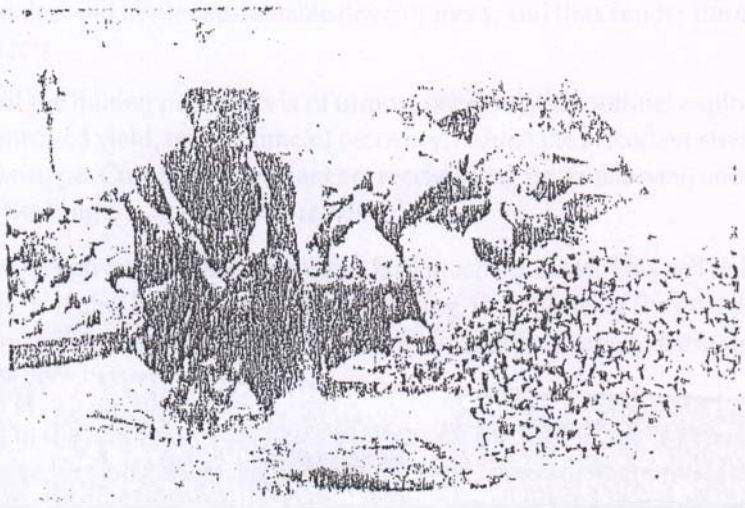
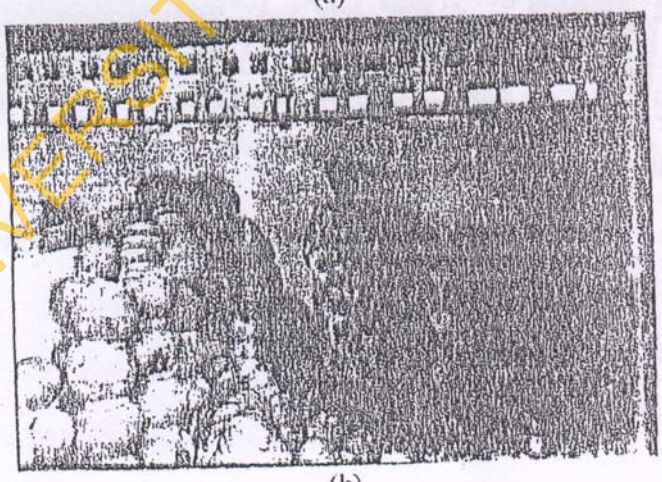


Fig. 6. Manual crushing of rocks for chips and aggregates, around Abeokuta, southwestern Nigeria

(a)



(b)

Fig. 7. The engagement of women (a) processing of clay and (b) sale of pottery wares at Imope, southwestern Nigeria

Fig. 8. Gold mining in Birnin Gwari, central Nigeria

Contributions and Indices for Sustainable Growth of the Enterprises

It is obvious from the presentation on the undertakings and projects, that the availability of mineral resources is not in doubt. The sustainability of the mining/production and subsequent processing may however pose some problems which could hinder sustainable development, and thus render the enormous resources as dead or inactive assets.

Mechanization of the mining processes is of utmost necessity, for optimal exploitation of the deposits. This will lead to improved yield, reduce time of recovery, reduce the attendant stress on human resources and also minimize wastage. Currently, few mines are mechanized, hence allowing uncontrolled, unorganized, hazardous, and on the long run unprofitable results.

Appropriate mine design even for small deposits, is of much necessity. This will reduce hazards, therefore, enhancing mine safety. It also helps in ore yield monitoring, thus allowing for proper operational planning. Suitable mine design will also reduce greatly environmental effects arising from the exploitation of these mineral resources.

Professionalism in the whole process from exploration through primary processing, application and marketing should also be emphasized. Informal and formal training programmes directly or indirectly on site or otherwise, would go a long way to increase effectiveness, enhance appropriate management and allow for a proper control of the mining enterprises.

Implications of the Undertakings

Socio-economic Perspectives

In this section, the socio-economic characteristics of the respondents from selected mining communities and the perceived impacts of mining on the infrastructure and health of the people are discussed. It is pertinent to note that the mining communities were selected from the six geopolitical zones of Nigeria, in order to ensure representative coverage or sample population.

As a matter of fact, small-scale mining of minerals is carried out in virtually all parts of the country. Table 2 shows the geopolitical zone, the State and the Local Government Area (LGA) of each of the selected community. On the whole, at least 16.7% of the respondents were interviewed from each geo-political zone. As shown in Table 2, the respondents are spread over 8 States, 10 Local Government Areas, and 14 mining communities in the country. Efforts were also made to establish the nationality-mix of the population of each of the mining communities. In any case, almost 4/5 (77.8%) of the respondents in the mining communities, are Nigerians (Table 3). The others are from neighbouring countries namely Niger (5.0%), Mali (5.0%), Togo (4.0%), Chad Republic (4.4%) and Benin Republic (3.3%). The pictorial illustration is provided by Fig. 9.

Table 2 and Fig. 9 also indicate that artisanal mining is practiced throughout the West-African sub-region, cutting across the anglophone and franco-phone countries. Demographic characterization of the respondents shows that the male and female respectively account for 56.7% and 43.3%. The relatively high percentage of the female vividly demonstrate the important roles of women in small-scale mining. Table 4 depicts the age distribution of the respondents, and illustrates that most are of the working age group of 25-60 years. The group accounts for almost half (48.3%), while children/adolescents of less than 20 years constitute 35%. This demographic profile is true of most mining settlements in Africa, where children are employed or used as cheap labour in different aspect of the activities. It is equally pertinent to note that the mining communities include aged people, which make up 16.7% of the population.

Most of the respondents (62.2%) are married, with more than a quarter (25.6%) being either widow or widower. Only 8.9% of the respondents are single and 3.3% divorced. Unlike in most African mining communities, the respondents from the Nigerian situations, are quite literate in western education. As shown in Table 5, those without formal education, are less than 1/5th of the respondents. Respondents with secondary and tertiary education account for 2/5th each, of the total respondents. It is pertinent to observe the high percentage of respondents with tertiary education (40.6%), despite the fact that most of the mining communities are located in rural areas.

In terms of occupational involvement, more than 3/5 (64.4%) of the respondents are primarily engaged in farming (Table 6, Fig. 10). This reflects the fact that most of the mining communities are located in the rural parts of the country. The outcome of the survey also suggests that for 76.7%, mining is important as a secondary occupation. Hence, participation in mining activities by members of the communities could be regarded as a part-time job, especially during the dry season, or in areas where there is shortage of land for farming. It is pertinent to note the fairly high percentage of students who adopt mining as their major occupation (5.6%), despite the fact that they are still schooling (Table 6). Approximately 1/3 of each of the respondents within each community, are either investors in mining activities (31.7%) or owners of lands where the mineral deposits occur (33.3%). The community leaders constitute a further (11.7%). As regards the sources of funds for the mining activities, Fig. 11 indicates that the bulk are from personal savings. A further 14.5% of the respondents claimed to have obtained bank loans to finance the operations (Table 7).

Table 2. Geographical parameters of the selected mining communities

Geo-political Zone	*State*	*LGA*	*Community*
North-East	Bauchi	Tafa-Balewa	Lukshi
			Dass
North-West	Kaduna	Birnin-Gwari	Janruwa
			Sounguri
North-Central	Plateau	Kuje	Kuje
	Federal Capital Territory	Abuja Municipal	Mpampe
South-West	Oyo	Itesiwaju	Komu
	Ogun	Ijebu-North	Imope
South-East	Ebonyi	Abakaliki	Enyingba
South-South	Cross-River	Yala	Okpoma

Table 3. Nationality-mix of respondents

Country of origin	*Frequency*	*%*
Nigeria	140	77.8
Togo	8	4.4
Niger	9	5.0
Benin	6	3.3
Chad republic	8	4.4
Mali	9	5.0
Total	180	100.0

Source: Field Survey, January 2005

Table 4. Age-distribution of the respondents

Age categories	*Frequency*	*%*
≤ 20 years	63	35.0
21-40 years	62	34.4
41-60 years	25	13.4
≤ -61 years	30	16.7
Total	180	100.0

Table 5. Highest educational level of respondents

Highest educational level	*Frequency*	*%*
No formal Education	34	18.8
Secondary Education	73	40.6
Tertiary education	73	40.6
Total	180	100.0

Source: Field Survey, January 2005

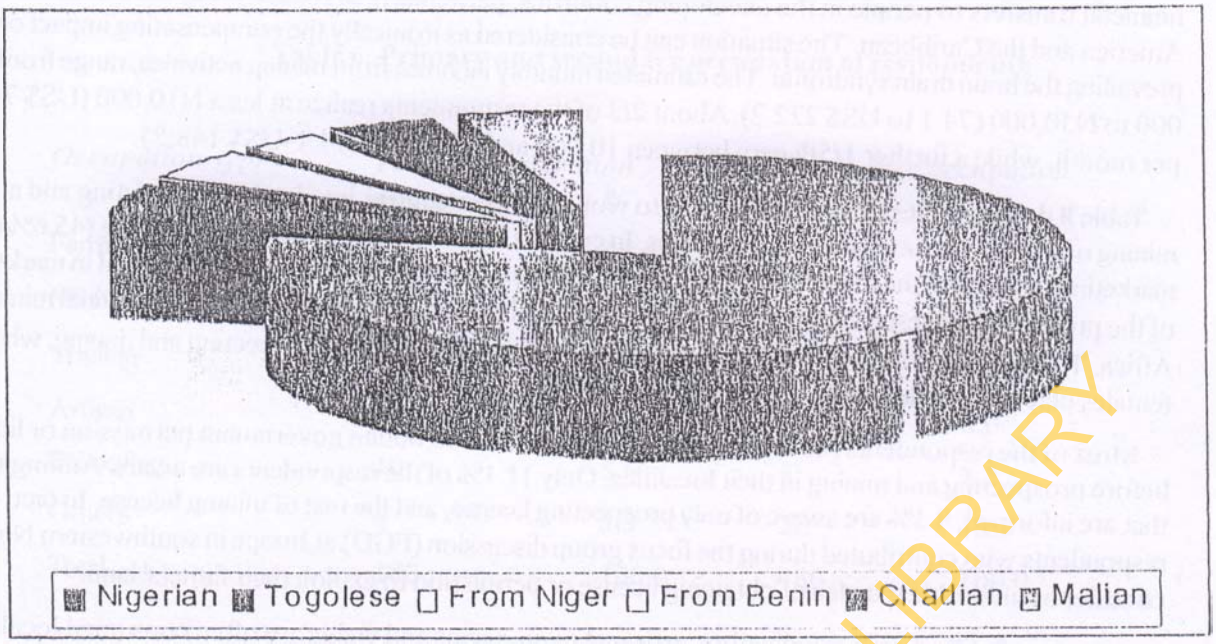


Fig. 9. Nationality distribution pattern in mining communities

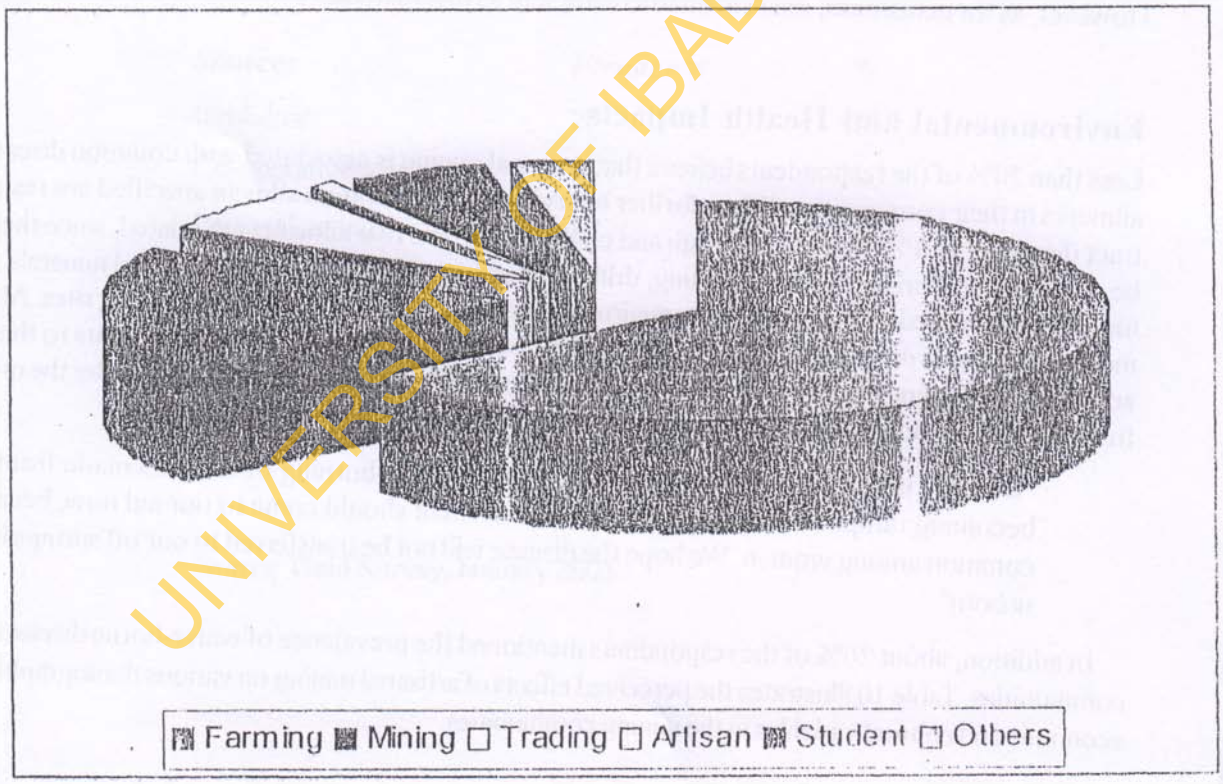


Fig. 10. Illustration of occupational distribution

The high percentage of respondents depending on personal savings, is a reflection of the small-scale nature of the activities. It is noteworthy that though low (Table 7), remittances from relatives abroad, also constitute a source of finance. As matter of fact, recent reports confirm the significance of such foreign-derived financial transfers to people in the developing countries, particularly of Africa, Asia, Central and South America and the Caribbean. The situation can be considered as ironically the compensating impact of the prevailing the brain drain syndrome. The estimated monthly incomes from mining activities, range from 10, 000 to N30,000 (74.1 to US$ 222.2). About 2/3 of the respondents realize at least N10,000 (US$ 74.1) per month, while a further 1/5th earn between 10,000 and N20,000 (74.1-US$ 148.2).

Table 8 demonstrates that in comparison to women, men are more involved in prospecting and actual mining of minerals in most of the communities. In contrast, women dominate in the processing (45.6%) and marketing (49.4%) of the mineral products (Fig. 7). Similarly, more girls than boys are engaged in marketing of the products. The result clearly indicates that there is also gender division of labour in artisanal mining in Africa. The males are collectively more involved in the upstream stages of prospecting and mining, whereas females play major roles in processing and marketing of the winnings.

Most of the respondents (85%) are not aware of the need to obtain government permission or license before prospecting and mining in their localities. Only 11.1% of the respondents are aware. Among those that are informed, 8.3% are aware of only prospecting license, and the rest of mining license. In fact, most respondents who contributed during the focus group discussion (FGD) at Imope in southwestern Nigeria, consider as untenable the idea of obtaining license or permission to exploit their fathers' land.

In terms of utilisation or application, artisanal mining wins and yields are often consumed locally for various purposes (Fig. 12). Areas of demand include cumulatively, for income generation (52.2%), decoration purposes (14.4%), ornamental uses (12.2), industrial and local crafts (15.0%) and construction purposes (1.7%). The perceived national and international consumption patterns are reflected in Table 9. However, as for gemstones, much are particularly sold as raw materials in foreign markets.

Environmental and Health Impacts

Less than 30% of the respondents believe that artisanal mining is associated with common diseases and ailments in their communities. When further interviewed, the common ailment specified are respiratory tract diseases (11.1%), as well as cough and cold (5.0%). The two ailments are related, since they could be caused by dust arising from excavating, drilling, crushing and processing of rocks and minerals. In fact, most of the specified ailments are due to environmental pollution in and around the mining sites. Although, most respondents during the questionnaire survey, could not relate the common ailments to the mining activities, the findings from the FGD at Imope, contradict the posture, as shown below by the quotation from the contribution of the Olu of the community.

> "we have noticed that eye disease as a result of open-burning of the pots made from clay, is becoming rampant in this community. Government should come to our aid now, because it is common among women. We hope the disease will not be transferred to our offsprings born and unborn"

In addition, about 20% of the respondents mentioned the prevalence of water-borne diseases in their communities. Table 10 illustrates the perceived effects of artisanal mining on various demographic, socio-economic and cultural variables in the mining communities.

Table 6. Primary and secondary occupation of respondents

Occupation type	*Primary occupation*		*Secondary occupation*	
	Frequency	*%*	*Frequency*	*%*
Farming	116	64.4	4	2.2
Mining	34	18.9	138	76.7
Trading	12	6.7	12	6.7
Artisan	2	1.1	-	0.0
Schooling	10	5.6	4	2.2
Others	6	3.3	22	12.2
Total	180	100.0	180	100.0

Table 7. Sources of finance for small-scale mining activities in Nigeria

Sources	*Frequency*	*%*
Bank-loan	26	14.5
Co-operative-loan	2	1.1
Personal savings	87	87.3
Remittance from abroad	2	1.1
Others	8	4.5
No response	55	30.5
Total	180	100.0

Source Field Survey, January 2005

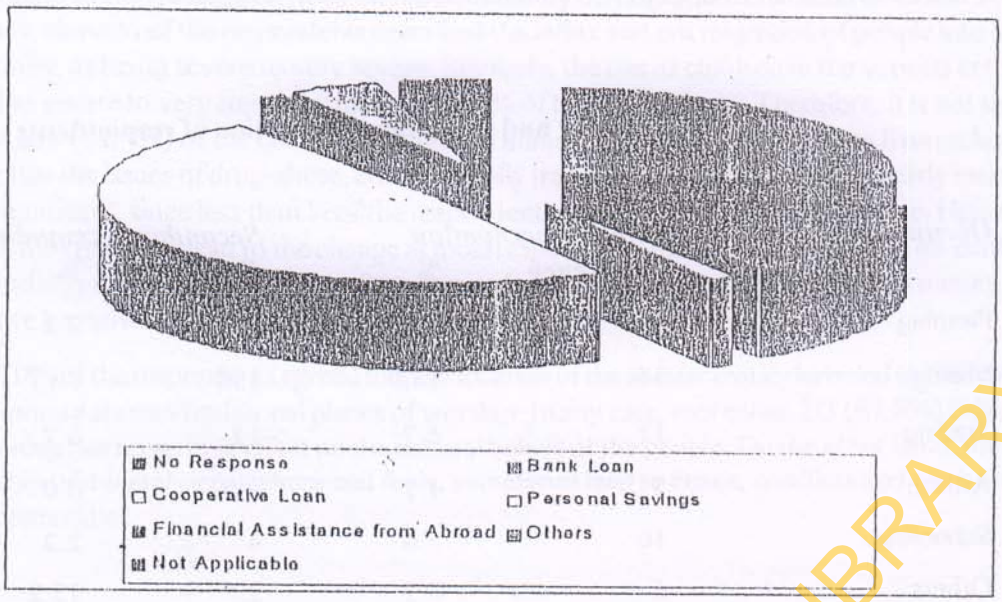


Fig. 11. Relative distribution of the sources of investment capital

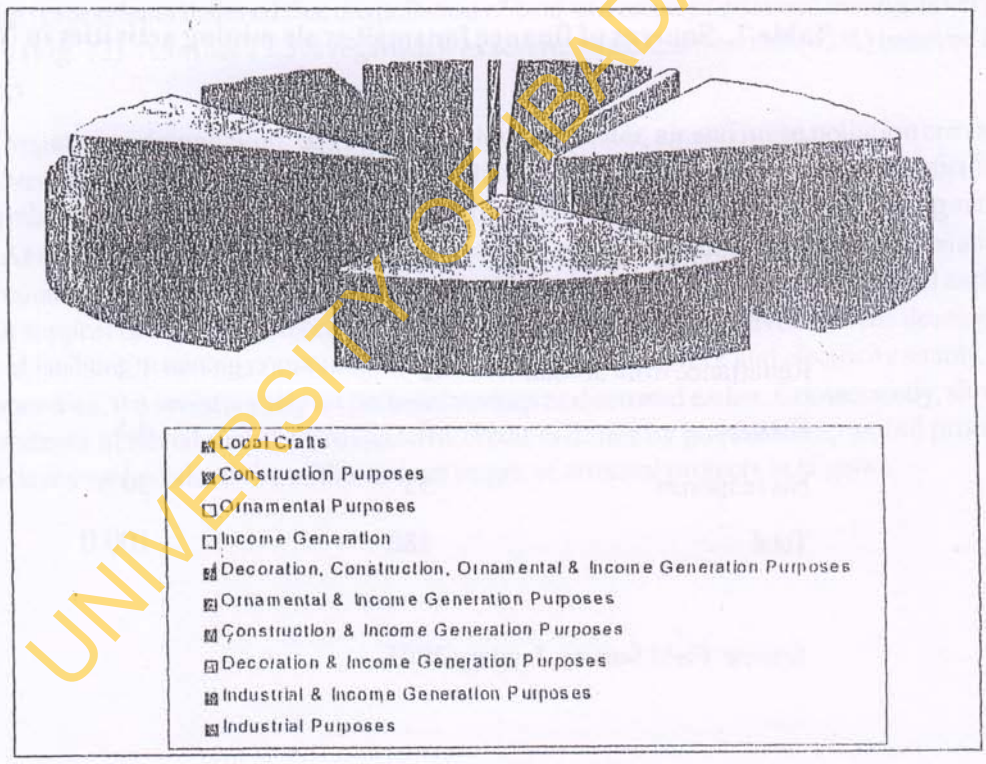


Fig. 12. Comparative distribution of the utilization of wins

Due to the small-scale nature of the undertakings, it is difficult for most respondents to perceive the negative impact of the mining activities on the community demographic characteristics and social life. Nevertheless, about ¼ of the respondents described the influx and out migration of people into and from the community, as being severe to very severe. Similarly, the use of children in the various activities, is considered as severe to very severe by more than 60% of the respondents. Therefore, it is not surprising that almost half (44.4%) of the children involved in mining activities are drop-outs from schools. It is welcoming that the issues of drug-abuse, crime, sexually transmitted disease (STD) and early marriage are currently significant, since less than ¼ of the respondents regarded them as being severe. However, the mining activities probably lead to the change in most respondents' primary occupation. This confirms the previous findings that more than 70% of the respondents may change from farming to mining, since it appears more lucrative for quick returns.

Almost 20% of the respondents agreed that the location of the sites/activities have led to the destruction of the community shrines/traditional places of worship. In any case, more than 2/3 (67.8%) believed that artisanal mining has no serious effect on the cultural beliefs of the people. On the other hand, the claim to the ownership of mineral occurrences and finds, sometimes lead to crises, conflicts and wars within and between communities.

Effects on Natural Resources

Mining whether at a small or large scale, usually result in the disturbance or destruction of the natural environmental components, such as vegetation, soil, water and ecosystem. These issues are more emphasized than the effects on the socio-economic characteristics, by most respondents. As shown in Table 11, more than 1/3 of the respondents believed that despoilation of land as a result of artisanal mining, is very severe in the country (Fig. 13). A further 13.3% regarded it as severe, while less than half (45%) believed it has no negative effect.

Similarly, vegetation degradation, soil contamination, and water, air and noise pollution are ranked as being very severe in most mining communities of all the geo-political zones of Nigeria. In particular, noise pollution, farmland destruction and air pollution rank high among the negative effects of mining activities in the country. As regards the ways of managing or mitigating the negative effects of mineral exploitation in the mining communities, about 40% of the respondents want government to invest more on mineral exploration, specifically in support of artisanal projects. Further, more than half (53.3%) advocated the development of infrastructural facilities in mining communities, especially the road network and electricity supply. In most mining communities, the investors rely on personal savings as discussed earlier. Consequently, almost 10% of the respondents believed that the provision of credit facilities by government, would promote and enhance efficiency and productivity of the various stages of artisanal projects in Nigeria.

Table 8. Gender distribution in mining project

Gender	*Prospecting*		*Mining*		*Processing*		*Marketing*	
	Frequency	*%*	*Frequency*	*%*	*Frequency*	*%*	*Frequency*	*%*
Men	62	34.4	86	47.8	79	43.9	83	46.1
Women	47	26.1	59	32.8	82	45.6	89	49.4
Boys	15	8.3	30	16.7	23	12.8	38	21.1
Girls	25	13.9	19	10.6	48	26.7	64	35.6

Table 9. Perceived national/international use of the minerals

Uses	*Frequency*	*%*
Income generation	25	13.9
Construction only	11	6.1
Ornamental only	1	0.6
Industrial uses only	9	5.0
Decoration, ornamental construction and income generation	36	20.0
Ornamental and income	40	22.2
Construction and income	15	8.3
Decoration and income	12	6.7
Industrial and income	31	17.2
Total	180	100

Source: Field Survey, January 2005

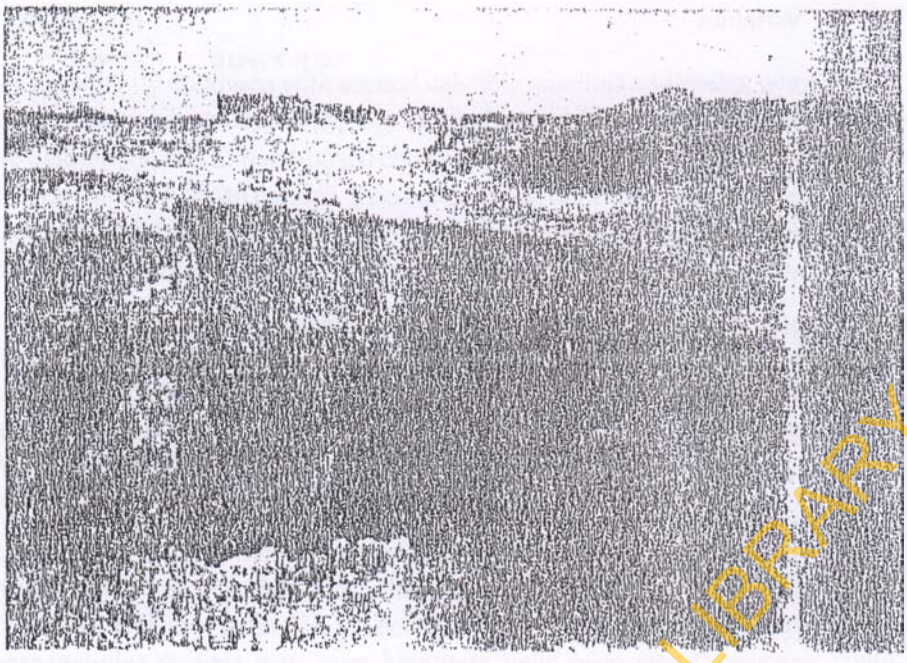
Table 10. Socio-cultural effects of artisanal mining in communities

Variables	Effects (%)			
	very severe	severe	less severe	no effect
Immigration	13.9	12.2	18.9	55.0
Emigration	11.1	13.3	6.7	68.9
Fairly stability	16.7	1.1	16.7	65.6
Neglect of household responsibilities	15.6	8.3	21.1	55.0
Child abuse	25.6	13.3	21.1	39.4
Child drop-out from school	15.6	4.4	24.4	55.6
Prevalence of drug abuse	17.2	5.6	4.4	72.8
Increase in sexual trade	14.4	4.4	10.0	71.1
Prevalence of STD	14.4	4.4	1.1	50.0
Early marriage	14.4	8.9	4.4	72.2
Crime prevalence	15.6	1.1	2.2	81.1
Change in occupation	5.6	21.7	10.0	62.8
Shortage of labour on farm	3.3	22.8	26.7	47.2
Destruction of traditional place of worship	18.9	3.3	10.0	67.8

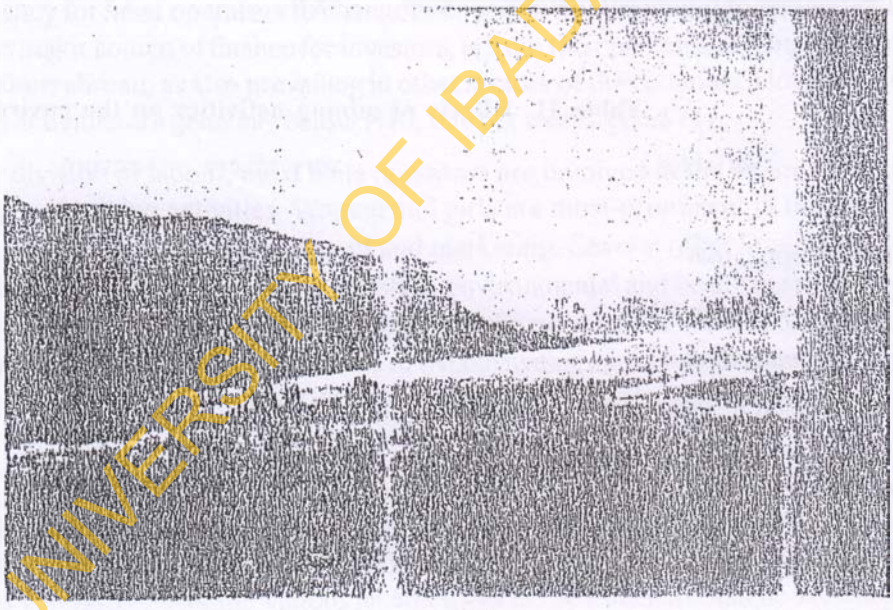
Table 11. Effects of mining activities on the environment

Variables	very severe	severe	less severe	no effect
Land despoilation	36.1	13.3	5.6	45.0
Vegetation degradation	31.1	18.9	12.8	37.2
Soil contamination	16.1	30.0	13.9	40.0
Destruction of farmland	38.3	11.1	15.0	35.6
Water pollution	25.0	11.7	24.7	38.9
Air pollution	33.0	15.6	18.9	32.2
Noise pollution	42.2	8.9	5.6	43.3
Collapse of mine pit	31.7	22.8	7.8	37.8

Source: Field Survey, January 2005



(a)



(b)

Fig. 13. Environmental effects of tin mining as exemplied by excavated land requiring reclamation and vegetation regeneration and

(b) development of open lakes and hydrants, Jos district

Conclusions and Recommendations

Overview

The continent of Africa is evidently endowed with several valuable minerals and rocks, whose distribution is essentially related to the variation in geological setting. Similarly, available information and the findings of this study aptly indicate that mining and mineral-based enterprises still constitute a major component of the informal economic sector of all the African nations. The bulk of such undertakings thrive in the rural areas where infrastructural facilities and living standards are vividly low (Figs. 14 & 15). Consequently, the preference, reliance and use of cheap child and women labour are substantial.

Notable projects include artisanal and small-scale activities in mining of ores, notably cassiterite, columbite, and tantalite and workings for precious metals (gold and platinum), gemstones and iron ores. Others are the mining and processing of industrial minerals and rocks, namely marble, limestone, clays, gypsum, talc, asbestos, barytes, diatomite, salts, sands, gravels and crystalline rocks (granites, gniesses). Some of the raw materials likewise support projects, such as in potteries, cosmetics, ceramics, paints, smelting and alloying, abrasives, refractories, building and construction.

As regards the operational set-ups, the manpower demands generally range from an individual to about 50 people. The proportion of women and children could be up to 50 and 10%, respectively. Simple tools and implements, which are rather labour intensive, are commonly employed in the various types and stages of the enterprises. These includes shovels, pick-axes, hammers, head pans, simple crushers, rolling mills and sieves.

This investigation further shows that mining in Africa, is currently a secondary occupation. At the same time, there is the tendency for most operators to change occupation from farming, and adopt mining as primary. Currently, the major source of finance for investors, is from their personal earnings, and at best, remittances from relations abroad, as also prevailing in other sectors of the economy. However, returns and revenues from the activities are generally below N10, 000 per month (US$74).

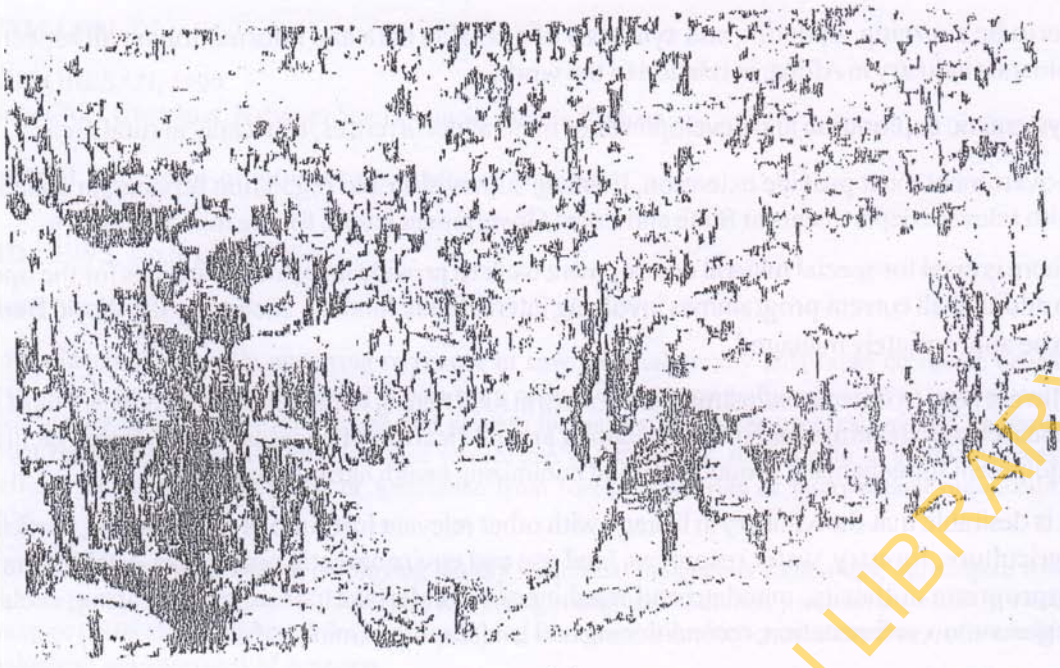
In terms of gender division of labour, most male operators are involved in the upstream segments involving prospecting and mining activities. Women and girls are most prominent in the middle and downstream sectors, notably processing, treatment and marketing. Several other implications of the undertakings can be isolated, which have socio-economic, environmental and health perspectives. For example, in highly prosperous areas, especially rich in gemstones, the enormous influx of operators including foreigners, commonly result in the creation of enclaves of overcrowding and shanty settlements (Fig. 15). Also, there is increase in child labour and school drop outs, shortage of farm hands, and hence high lost of agricultural produce.

On the other hand, the consequences of substantial immigration and human trafficking result in increase in sexual trade, prevalence of sexually transmitted diseases, as well as early marriages and unwanted pregnancies. Furthermore, the operations lead to land despoilation, vegetation degradation, soil contamination, plus air and water pollution. Various air and water borne ailments could be associated with mining and mineral processing, such as respiratory tract diseases, eye infections, cholera, diarrhoea, and as earlier motioned sexual transmitted diseases (STDs).

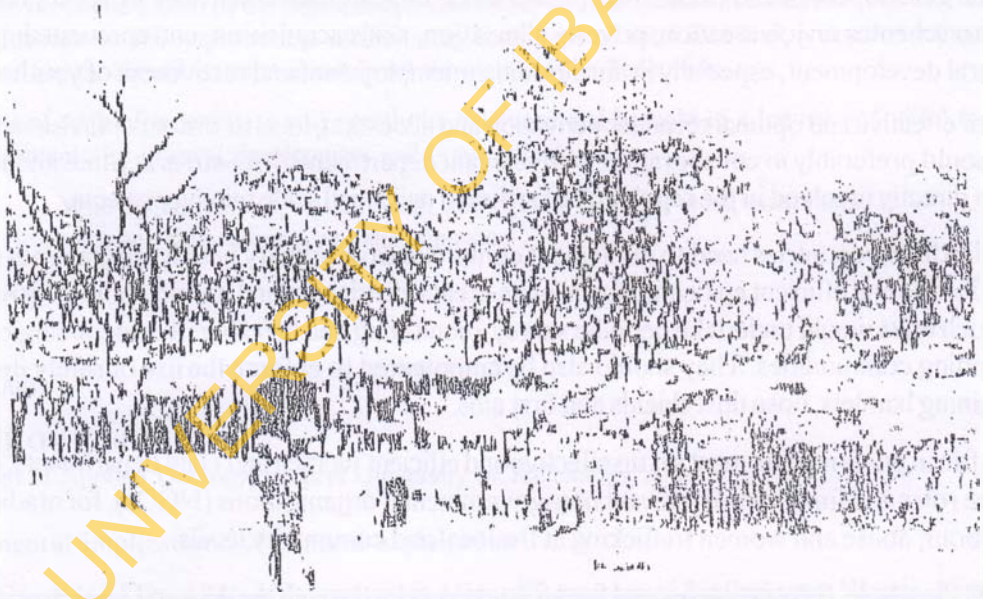
(a)

(b)

Fig. 14a&b. Typical population mix in an artisanal mining settlement close to Jos, central Nigeria



(a)



(b)

Fig. 15. Overcrowding and development of shanty settlement for gemstone workings in Komu area, southwestern Nigeria

Recommendations

In view of the prevailing deplorable conditions of most mining communities and the need to ensure sustainable growth of the minerals industry in Africa, the following suggestions are pertinent for urgent action.

- Periodic sourcing, updating and synthesis of available data and information on all aspects of the minerals industry in Africa, in relation to the world.
- Systematic exploration and development of mineral occurrences, especially in rural areas.
- Government must provide extension, training, supervision and regulation services, in collaboration with relevant departments at State and Local Government levels, for the mining industry.
- There is need for special mineral development bank to provide investment facilities for the operators. In addition all current programmes involving international funding, such as by the World Bank, need to be appropriately managed.
- There is need to improve infrastructural facilities in rural mining communities. Government must support research and development in the designing and fabrication of necessary operational facilities and equipment for enhancing productivity and minimizing health hazards and risks.
- It is desirable that the Ministry in linkage with other relevant institutions and agencies, particularly in agriculture, forestry, water resources, land use and environmental protection, establish units with appropriate authority, mandate and machinery to undertake periodic monitoring, reclamation regeneration, reforestation, reconditioning and landscaping of mining districts.
- The artisanal operators, land owners and local authorities need to be urgently organized into cooperative bodies or shareholders of the ventures, with the government being involved in supervision of the operations.
- The government should ensure that artisanal and small scale mining activities are appropriately integrated into schemes on job creation, poverty alleviation, skills acquisition, entrepreneurship training and rural development, especially in ameliorating unemployment and restiveness of youths.
- For effective and optimal revenues derivation and allocation, local or district or divisional governments should preferably in collaboration with relevant departments/Ministries at State and Federal levels, be directly involved in the regulation of artisanal and small scale mining projects.
- All African countries need to implement comprehensive primary health programmes incorporating effective and efficient epidemiological units in each district or rural division or local government area. Such units would undertake periodic survey, monitoring and handling of epidemiological problems in mining communities. They should also be empowered to enforce the use of safety devices, such as mining hamlets, nose dust shields and first aids.
- African governments must set up effective and efficient women and child departments, irrespective of the roles and functions of relevant non-governmental organizations (NGOs), for eradication of child labour, abuse and women trafficking at the local and community levels.
- On the whole, there is urgent need for African countries through the African Union, to evolve necessary African approach for effective conflicts management and resolution, for sustainable development of the minerals industry. Similarly, it is desirable to establish a continental network for collaboration, exchange and utilization of mineral resources, by the countries of Africa.

Bibliography

PASSMA/001

T. ADEGBESAN, 1990
Deputy Chief Geologist, National Steel Council, Malali, Kaduna

Industrial utilization of mineral resources of Nigeria

AGID NEWS, No. 61/62

Summary

An abundance of naturally occurring resources or raw material greatly aids rapid economic development and industrial advancement. Such naturally occurring resources are essentially agricultural, geological or mineral-based. Ideally, a nation should harness and process the natural resources occurring within its borders, through its own resilience and self-effort. In cases where, due to limitations, it is unable to do this successfully alone, beneficial technical co-operation or assistance from foreign countries or international organizations may be sought.

For a young developing nation, employing mainly traditional indigenous technology, agriculture will invariably be the mainstay of the economy. However, it is being recognised that heavy industries, notably steel, petroleum refining or petro-chemical-based projects employing advanced or sophisticated technology, are reliable indicators of industrial advancement of a nation.

Unlike agricultural materials, geological raw materials are depletable, non-renewable resources. It is therefore essential that concerted efforts be made to support exploration and mining projects in order to ensure the success of vital mineral-based industries all over the country.

To stimulate the participation of the organized private sector and individuals in the development of mineral based cottage industries for the improvement of the living conditions of rural dwellers, a detailed mineral resources inventory or survey should be carried out in all the states of the Federation.

The success of such of an exercise will greatly be enhanced and brought to a logical or fruitful conclusion by the establishment of a mineral development and finance bank.

Key words: resources, economic, agricultural, geological, mineral, steel, petroleum, refining, technology, non-renewable, mining, cottage, finance

4 figures, 3 tables

PASSMA/002

J.A. ADEKOYA, 2003
Department of Applied Geology, Federal University of Technology, Akure

Environmental implications of mineral exploitation

In: A.A. Elueze (ed.), Prospects of Investment in Mineral Resources of Southwestern Nigeria, Nigerian Mining and Geoscience Society (NMGS), pp. 117-122.

Summary

Nigeria is endowed with abundant mineral resources, which have contributed immensely to the national socio-economic development. Before the minerals could make such contribution, they must undergo three stages of

development, viz, exploration, mining and processing. The three stages of mineral development have caused difference types of environmental damage, which include ecological disturbance, destruction of natural flora and fauna, pollution of air, land and water, geological hazards caused by instability of soil and rock masses, landscape degradation and radiation hazards. The environmental damage has in turn resulted in waste of arable land, as well as economic crops and trees.

Since much of the damage is inevitable if the minerals must be developed, both the government and the mineral industry must be involved in taking precautionary and remedial measures that can minimize the ill-effects of mineral development. While the government should provide the regulatory legislation with appropriate sanctions, the mineral-producing companies are expected to carry out mandatory precautions, remedies or compensation for the damage done.

Key words: mineral, exploration, environmental damage, remedial measures, regulatory, precautions

2 figures, 3 tables, 5 references

PASSMA/003

J.A. ADEKOYA, 2003
Department of Applied Geology, Federal university of Technology, Akure, Nigeria.

Monetization prospects of industrial minerals

In: A.A. Elueze (ed.), Prospects for Investment in Mineral resources of Southwestern Nigeria, Nigeria Mining and Geosciences Society (NMGS), pp. 111-115

Summary

The prospects of monetizing industrial minerals depend essentially on two sets of investment determinants. The first set relates to the prevailing investment climate that applies to all commodities in general, while the second involves the attributes of the minerals. Most of the attributes are peculiar to each mineral deposit and are the final determinants of the investment possibilities of monetization prospects of any mineral. When the limestone, marble and talc deposits of southwestern Nigeria were considered in the light of the second set of criteria for determining investment prospects, it was found that the limestone and marble deposit of Ogun, Oyo and Ondo States had prospects for large-scale investments. This conclusion was based mainly on their large reserves and their chemical and physical properties that favour the production of useful end products such as Portland cement, lime, etc. The talc, on the other hand, occurs in Oyo and Osun States in small bodies, which can only support small scale mining operations, although their physical and chemical attributes indicate their suitability for use in local industries, namely, ceramic, paints, plastics, rubber, etc. Because the monetization prospects of the limestone and marble are very high, it is expected that the socio-economic benefits derivable for investments on these minerals would also be considerable. Such benefits would include improvement in the earning/ purchasing power of workers in the mineral industry, development of social amenities and infrastructures, generation of revenue to finance government activities and instigation of economic activities in the mining districts.

Key words: monetization, prospects, industrial minerals, investment attributes

6 tables, 3 figures, 4 references

PASSMA/004

J.A. ADEKOYA, O.O. KEHINDE-PHILLIPS and A.M. ODUKOYA, 2003
Department of Applied Geology, Federal University of Technology, Akure

Geological distribution of mineral resources in southwestern Nigeria

In: A.A. Elueze (ed.), Prospects for Investment in Mineral Resources of Southwestern Nigeria, NigerianMining and Geosciences Society (NMGS), pp. 1-13

Summary

The occurrences and distribution of the resources of southwestern Nigeria are intimately associated with the geology of the area. The basement complex of southwestern Nigeria lies to the east of the West Africa Craton, an area that has undergone late Precambrian to early Palaeozoic orogeneses. To the east and south, the Mesozoic – Recent sediments of the Dahomey and Niger Delta Basins cover the basement complex.

The mineral resources of southwestern Nigeria are grouped into three, namely: metalliferous, industrial and energy minerals. These minerals can also be grouped into economic into economic mineral deposits, which reserves are known or approximated and occurrences to which tonnage cannot be imputed. The basement complex of southwestern Nigeria hosts important deposits of gold, in the Ife-Ilesa schist belt and tin-tantallum-niobium in the pegmatites of Ijero and Iregun. Gemstones such as aquamarine, zircon, rutile and emerald are illegally mined at Ofiki and Olode. Occurrences of nickel and chromite are known in Ife-Ilesha area. Feldspars and quartz occur widely in Ogbomoso area.

Extensive deposits of talc are found at Apomu and Ilesha. Feldspars and quartz occur widely in the pegmatites of Olode. Osogbo, Iwo, Iregun and Ijero. There is an important deposit of marble with the migmatite-gneiss complex of Igbeti. Construction aggregates are widely distributed. Similarly are occurrences of bauxite in Orin Ekiti and Oyan, sillimanite in Orin Ekiti, Oyan and Ibadan, while molybdenum are in Ikere-Ekiti.

In the sedimentary terrain of southwestern Nigeria, there are important deposits of limestone at Shagamu, Ewekoro, and Ibese; silica sands at Aiyetoro, Ijebu-Ife, Okitipupa, Ijero, Lekki and Igbokoda. Extensive deposits of kaolin are found at Ebe, Ibese, Imeko among others, Brick clay deposits are ubiqous. There are occurrences of phosphates at Oshosun, Seriki-Oko, Idogo, Akinside and Fagbohun. These occurreces are associated with gypsum and are radioactive. Important deposits of tar sand are found at Yemoji, Iwopin and Agbabu.

Some of the mineral deposits are small in size and not suitable for large-scale mining enterprises. With interest in small-scale mining increasing and as the industrial infrastructure in southwestern Nigeria grows, small low-cost mining ventures can contribute to economic development of the study area by providing raw materials that would otherwise have to be imported. In order for government or private entrepreneurs to reap maximum benefits from their investment in mining ventures, the problem of illegal mining, particularly of gold and gemstones will have to be addressed.

Key words: resources, basement, minerals, orogeneses, Precambrian, Palaeozoic

1 table, 18 references

PASSMA/005

T.R. AJAYI and O. OGEDENGBE, 2003
Department of Geology, Obafemi Awolowo University, Ile-Ife

Opportunities for the exploitation of precious and rare-metals in Nigeria

In: A.A. Elueze (ed.), Prospects for Investment in Mineral Resources of Southwestern Nigeria, Nigerian Mining and Geosciences Society (NMGS), pp. 15-26

Summary

Gold, a precious metal with unique physical and economic qualities and tantallum with its special properties, are in high commercial demand because of their economic values., These metals had long been mined in Nigeria, with the alluvial – eluvial deposits being the main source.

Exploration reveals their occurrence in well-defined metallogenic belts, but their exploitation had been largely on a small scale, haphazard and dominated by artisanal miners. The primary deposits recently investigated in detail, are promising prospects for investors. The continuous search for these concealed, low-grade primary deposits through extensive and intensive exploration programmes, needs to be pursued by all tiers of government for the development of the minerals industry in Nigeria.

Key words: gold, tantallum, alluvial, eluvial, metallogenic belts, artisanal, deposits

8 figures, 7 tables, 21 references

PASSMA/006

S.O. AJETUMOBI, 1999
Makeri Smelting Company, Jos

Import substitution possibilities

Proceedings of the First Mining in Nigeria Conference and Workshop, Ministry of Solid Minerals Development, Federal Republic of Nigeria, NIMAMOP, Global Minerals Limited, pp. 107-110

Summary

The subject of this discussion is very relevant at this time, because the current economic condition of the country requires improvement, having stablised for some time now. Since 1993/94, the industrial capacity utilisation has hovered almost consistently about the 30% mark. The economy has been characterized by low investment over the past years. Manufacturing investment stood at 2,256.1 million as at June 1997, representing a decline of 803,92 million or 26.3% on the level for the corresponding period of 1996. No new investments are being undertaken by existing industries, private industrial capital expenditures being limited to capacity expansion, replacement and efficiency improvement.

Government having recognised that the market resistance to output of the manufacturing industries is responsible for this situation, has planned during the current year to stimulate the economy. According to the Finance Minster, the 1998 annual budget of the Federal Government is a Budget of Trasition from emphasis on stability to emphasis on growth and development, and emphasis on external dependence to emphasis on greater self-reliance.

The development and production of solid mineral commodities certainly offer an opportunity to impact the Nigerian economy in three significant ways:

- foreign exchange earnings;
- regional economical development; and
- import substitution

Key words: economic condition, capacity, manufacturing, growth, budget.

3 tables

PASSMA/007

B.D. AKO, 2003
Department of Geology, Obafemi Awolowo University, Ile-Ife

Exploration strategies for bitumen saturated sands in Nigeria

In: A.A. Elueze (ed.), Prospects for Investment in Mineral Resources of Southwestern Nigeria, NigerianMining and Geosciences Society (NMGS), pp. 61-66

Summary

Bituminous sands occur in southwestern Nigeria, in a belt stretching from east of Ijebu-Ode (Ogun State) to Siluko and Akotogbo areas in Okitipupa (Ondo State) and to Edo State. The covers a distance of approximately 110km. The bituminous sand are composed of sands, heavy oil and clays that are rich in mineral and water. The heavy oil fraction in the bituminous sands is called bitumen.

They occur usually at very shallow to fairly deep levels (0- >1,000m). The bitumen sands in Nigeria are associated with Afowo Formation which is composed of fine to medium grained sand with clay and silt interbeds. These bitumen-impregnated beds are stratigraphically controlled and exploration involves detailed mapping of the subsurface. The methods most effective for this purpose are geological mapping, topographic/terrain mapping, geophysical survey (subsurface or borcholes), drilling and coring.

The results obtained using geophysics could result not only in the reduction in number of borcholes to be drilled/ cored, but would assist in the proper selection of drill sites, and reduces the overall cost of exploration.

Key words: bituminous sands, Afowe Formation, exploration, geophysical methods

1 tables, 1 figures, 13 references

PASSMA/008

S. ALFA, 1999
International Labour Office, Geneva

Child labour in small-scale mines in Niger

In: N.S. Jennings (ed.), SAP 2, 78/WPO. 137

Summary

Niger, a country located at the heart of the Sahel, covers an area of 1,267,000 sqkm, two-thirds of which are dessert. Depending on the area of the country, the rainy season lasts three or four months (June to September). The country has very few water resources with only one river that passes through it for nearly 500km in the west, and lakes and gullies in the east and south. In terms of communication infrastructure, although Niger has a dense road network, air traffic is virtually zero, while rail and sea transport systems are non-existent.

The population is estimated at nearly 9.5 million with a labour force participation rate of 52 per cent, mainly involved in the primary sector (78.20 per cent). The salaried population comprised 2.47 per cent of the total. The informal sector on its own accounts for 70.70 per cent of gross domestic product (GDP), which was estimated at 1,017 billion CFA Franc in 1996.

These various data highlight the enslavement of the country and the difficulties facing the vast majority of Niger's population, in particular children under 15 who account for 48.50 per cent of the total population. The school attendance rate was estimated at 27 per cent in 1996.

Such a situation of grinding poverty (73% below the poverty line) has led to the development of small-scale economic activities, including small-scale mining, which is the largest activity despite low profits and high risk. These small-scale mining activities (artisanal and semi-industrial) have expanded to allow mutual survival. In the

artisanal mining sector, the population is engaged in the mining of gold, gypsum, limestone, salt, trona, construction materials (e.g., gravel, sand and laterite), phosphate, cassiterite and coal.

These activities involve adults as well as children, and take place in atrocious conditions. The income derived from such activities is hardly enough for those working to survival, because in some instances, merchants keep the largest part.

Key words: infrastructure, road network, enslavement, high risk, survival

3 tables, 5 figures

PASSMA/009

O. A. ARIBISALA, 1992
Raw Materials Research and Development Council, Lagos, Nigeria

Exploitation and export prospects of Nigerian non-metallic minerals

AGID NEWS, No. 71, p.24

Summary

This paper discusses the occurrence and utilization of the major non-metallic minerals in Nigeria, with a highlight on the prospects for exports to earn foreign exchange. Non-metallic materials are in general common substances with relatively low prices when compared to metals. Being bulky materials, the economic value of these non-metallic minerals is determined by the cost of transportation. Except for a few materials such as gemstones, non-metallic mineral deposits usually consist entirely of valuable materials with little or no waste from overburden. Processing or beneficiation of their useful components leads to value added, thereby enabling them to meet the specification of the industries.

Key words: utilization, export, cost, overburden, processing

PASSMA/010

R.K. ASABERE, 1993
Mining Engineering Department, School of Mines, University of Science and Technology, P. O. Box 237, Tarkwa, Ghana, West Africa

Feasibility of mineral activity: what aspects should a developing country consider?

AGID NEWS, No. 72/73, p.19

Summary

In many developing countries, the national government plays an important role in formulating and evaluating mining and other investment projects, although the mix of private and public sector investment varies from country to country. Either by direct investment in the public sector or by imposing controls on private investment or by the use of taxes, tarrifs, etc. or by the rational use of scarce investment resources, the government is in a position to guide investment in the country.

Investment decisions in the mineral industry should not only be based on the financial feasibility report of the project alone, but that the decision should also be to investigate the effects of the mining.

Key words: developing country, public sector, tariffs, decisions, feasibility

3 figures, 3 tables

PASSMA/011

D.E. ATTANDU, 2003
Mines Department, Federal Ministry of Solid Minerals Development, Ibadan

Regulatory aspects of mineral resources development and exploitation in Nigeria

In: A.A. Elueze (ed.), Prospects for Investment in Mineral Resources of Southwestern Nigeria, NigerianMining and Geosciences Society (NMGS), pp. 89-92

Summary

This paper discusses the old and new Mining Acts in a comparative manner, the character of mine land titles and the provisions of the law relevant to their operation. The key to understanding the regulation of the mining industry (Part 1, Section 1 of the Minerals and Mining Act) is highlighted. This provides that all the mineral occurrences in Nigeria (on land, streams, rivers, water courses, etc.) are the prosperity of the Federal Government of Nigeria. The understanding of this provision by all stakeholders will go a long way to minimize mine land controversies and illegal mining in Nigeria in general and the southwest in particular. Special mention is made on the issues of obligations and rights of title holders, powers and duties of Mines Officers and other miscellaneous provisions, including trade on and possession of minerals. It also defines a mining lease as a written agreement between the Federal Government and the lessee which allows the later to exploit solid minerals anywhere in Nigeria, under the provisions of the mining law.

Mining operation involves disturbance of the surface right of land owner or land occupier, as well as environmental degradation. In consequence, the grant of a mining leases carried with it express compensation to land owners or occupier, payment of surface rents and royalties, safe, orderly and efficient operation.

The applicant for a mining lease must possess appropriate technical (professional) competence as well as proven financial capability prior to the grant of a mining lease and must not stop operation for a continuos period of six months from the date of grants. There are however regulatory provisions for the protection of the lessee and the investments for extraneous incursion. A mining lease could be temporary or substantive, each having its covenants or conditions. It is the only legal title under which solid minerals can be mined in this country.

Key words: mining acts, mineland, illegal mining, mining lease, environmental degradation, royalties regulatory provisions, extraneous incursion

PASSMA/012

R. BERGVAL, 1982
Geological and Mining Service, Kleine Waterstraat 2-6, Paramarimbo, Suriname

Pilot plant recovery of gold at Loksie Hattie, Suriname

AGID NEWS, No. 30, pp. 29-30

Summary

A case study of small scale gold mining in Suriname, with a critical analysis of the problems and possible solutions.

Key words: mining, problems, Suriname

PASSMA/013

T.G. BLENKINSOP, 1990
Department of Geology, University of Zimbabwe, P. O. Box M. P. 167, Mount Pleasant, Harare, Zimbabwe

Small-scale gold mining in Zimbabwe

AGID NEWS, No. 61/62, pp. 11-12

Summary

A thriving small-scale gold mining industry exists in Zimbabwe today, providing an income for many thousands and earning valuable foreign exchange. Zimbabwe is the largest producer of gold in the African continent outside South Africa and, in 1988, it was the 11th largest producer in the world.

Output has increased steadily from 11.4 tonnes in 1980 to a peak of 14.9 tonnes in 1986. Although the small-scale industry results from the fortuitous combination of geological and economic factors, there are useful lessons to be drawn for small-scale mining in other parts of the world – both from the advantages enjoyed by the Zimbabwean miner, and his problems.

Small-scale gold mining is an important part of the Zimbabwe economy that benefits individuals directly, without foreign capital or exploitation. Because of the very nature of the deposits, small-scale operations are feasible in areas where large-scale techniques would be uneconomical: this is well illustrated in the Kurda area, which was prospected by Rio Tinto Zinc and then turned over to small-scale mining because it was the only feasible mining method. The future for the small-scale industry looks promising, encouraged by the floor good price and government education and services, expansion is occurring in both old and new small-scale mines. Small scale mining can also offer a greener alternative to some of the horrific environmental consequences of large operations that can be seen at several places in this beautiful land.

Key words: gold, mining, industry, geological, economic, exploitation, small-scale

3 figures, 4 tables

PASSMA/014

I. BOSIIINI, G. ALVARADO, S.I. ARREDONDO and G. SOTO, 1991

Status of women geoscientists in Latin America

AGID NEWS, No. 67/68, p. 29

A questionnaire was sent to 170 women geoscientists in Latin America to gain a qualitative and quantitative idea of their actual and future activities in this region. It was answered by 46 women from eight developing countries (Figure 1). Its conclusions were discussed at the First Meeting of Central American Women Geoscientists in San Jose, Costa Rica, on November 22, 1990.

Results

Academic grade: The distribution of the women that answered the questionnaire is shown in Figure 2. Most of them wanted to get a higher degree, the main factors of inconvenience being.

1. *Economic:* To get a higher degree means dedicating two or more years without a job and travelling out of their cities or countries.
2. *Family:* It is more difficult, when women get married and have children.
3. *Laboral:* Sometimes it is difficult to get support from their companies or institutions

Age range: About 74% of the women that answered the questionnaire were younger than 40 years and 56% younger than 35 (Figure 3), showing an increase in the numbers of women studying geosciences in the last 15-20 years.

Professional experience: According to the age range, only 37% of the women who answered the questionnaire had more than 10 years of professional experience (Figure 4).

Fields of work: 93% of the women that answered the questionnaire work in government institutions; none work for a private company.

Discrimination: Most of the women that answered the questionnaire said that there are sexual discrimination in geosciences.

Key words: qualitative, family, discrimination.

3 tables, 2 figures

PASSMA/015

I. BOSCHINI and S. ARRREDONDO, 1991
San Toe, Costa Rica

Meeting of Central American Women Geoscientists and Latin Perspectives

AGID NEWS, No. 67/68, p.45

Summary

AGID members, Ileana Boschini and Sandra Arredondo (both from Costa Rica) have together assembled an AGID sponsored conference "First Meeting of Central American Women Geoscientists" at the 7th Geological Congress of Central America (November 21, 1990) in San Jose, Costa Rica. Thirty geoscientists were present from 11 countries to discuss the isolation and other problems pertinent to women.

AGID's Councillors Guillermo Alvarado and Jorge Lopez-Rendon and Samuel Bonis (ex. AGID Councillor) went to the opening of the meeting. They explained AGID's purpose and other geoscientific activities that it supports in developing countries. Also Allan Lopez, President of the Costa Rican Geological Society and Gerardo Soto, Secretary of PICG-Costa Rica, were present, and participated actively as AGID members.

We think that the role of women in geosciences is increasing fast, we have a big group of women that are engaged in petrology, volcanology, seismology, palcontology, palynology, age determination, geochemistry, etc. However, only a few groups work in field geology, mining sector and oil and gas exploitation, this shows discrimination in these geoscientific activities. Similar discrimination happens when companies or institutions assign positions of responsibility (heads of offices, project managers, etc.).

The organizing committee of the 7th Geological Congress of Central America and the women geoscientists congratulated and paid homage to Dr. Beatriz Levi, brilliant geoscientist of Chile and Latin America.

Key words: geosciences, petrology, volcanology, siesmology, palcontology, palynology, age determination, geochemistry, field geology, mining, oil, gas

2 figures, 1 table

PASSMA/016

Z.M. CASTILLA, 1999
International Labour Office, Geneva

Child labour in traditional mining, Mollehuaca, Peru

SAP 2.78/WP.137

Summary

This paper examines the work environment and health conditions of children who are engaged in mining and metallurgical activities in the context of the Mollehuaca Project. The project addresses the social, technical, production and environmetnal problems of traditional gold mining in the Nasca-Ocona zone, an area of 50,000km².

Keyword: environmental, health, metallurgical, social, production

PASSMA/017

S.D.G. CAMPBELL and P.E.J. PITFIELD, 1991
Geological Survey Department, Ministry of Mines, P. O. Box 8039, Causeway, Harare, Zimbabwe

Training small – scale gold miners in Zimbabwe

AGID NEWS, No. 66, p.15

Summary

Gold mining is a vital component of Zimbabwe's economy, and its importance usually being seen in terms of the foreign exchange earnings it generates. However, gold mining and, in particular, small-scale gold mining are the main means of support for many Zimbabweans. Few small-scale miners have any real understanding of mining, and most operate largely on a trial-and-error, subsistence basis. This report describes the various avenues of training and advice open to small-scale gold miners in Zimbabwe, and in particular a series of seminars currently being organized jointly by the Overseas Development Administration (ODA) of the United Kingdom (under a technical cooperation programme with the Government of Zimbabwe) and the Small-Scale Miners Association of Zimbabwe (SSMAZ).

3 tables, 3 figures

PASSMA/018

J.S. CARMAN, 1983
226c Heritage Hubsomers, New York 10589, U.S.A.

Mining codes and private overseas investment

AGID Guide to Mineral Resources Development, p.19

Summary

First and foremost, it should never be overlooked that a mining code must be very carefully tailored, indeed, it should not be a more or less standardized document, but instead must reflect the distinctive character of the country concerned. The political system and philosophy, aspirations, physical setting, financial resources, capacity, skills and attitudes of those who do the work -- all of these and more constitute factors which eventually have to be weighed, frequently intuitively, and fed into the equation which will establish the parameters for development decisions and accordingly be decisive in determining the form and content of the code. At the same time it will have to be shaped in relation to the facts of life in the external world, particularly those parts from whence comes investment capital.

Key words: mining code, character of country, development, political system

4 tables, 3 figures

PASSMA/019

S. CRAMER, 1982
Institut fur Geologie, Free University, Altensteinstr. 34a, Berlin, Germany

The death of small mining in Chile

AGID NEWS, 30, pp.15-18

Summary

During the last ten years the relative importance of the small mining sector in the Chilean economy, has been in a steady decline. Recent price slumps, namely for copper, and the almost complete withdrawal of government services have further depressed the rentability of mining ventures already suffering from frozen exchange rates and high national interest rates resulting in extremely high capital costs. Fifty years of small mining promotion are reviewed in the light of the present collapse. The now popular switching-over from copper to higher priced gold mining is only a temporary relief to the diminishing mining community. But it is assumed, that as long as high unemployment exist, there will be a small mining sector working under any condition. Governments may find themselves obliged to maintain basic services and subsidies, especially in depressed isolated mining communities.

Key word: mining, copper, communities, unemployment, Chile

3 figures

PASSMA/020

O.A. DADA, 1991

The potential of Nigerian coals for industries
Lagos, Nigeria

AGID NEWS, No. 67/68, p.43

Summary

A national Seminar on the theme *The Potentials of Nigerian Coals for Industries* was held at the Federal Palace Hotel, Lagos, 17th July, 1991. The seminar, organized by the Nigerian Metallurgical Society as a 1991 mid-year event, was arranged in association with the Nigerian Coal Corporation, Enugu.

The seminar was attended by over 100 participants representing mineral investors, financial institutions, public and private organizations as well as academic and research institutions.

The seminar was declared open by the Air Vice-Marshall Nura Imam, Honorable Federal Minister of Mines, Power and Steel, Lagos, who highlighted the quality of Nigerian coals and encouraged the formation of joint-venture companies to enhance its utilisation.

Key word: coal, metallurgical, potentials, mineral.

Industrial Potentials of Nigerian Coals

2 figures, 3 tables

PASSMA/021

H.N. DIALA, 2003
Nigerian Coal Corporation, Enugu

The past, present and future of the coal industry in Nigeria

In: A.A. Elueze (ed.), Contributions of Geosciences and Mining to National Development, Nigeria Mining and Geosciences Society (NMGS), pp.41-49

Summary

A proven coal reserve of 639 million metric tonnes with a further 2 billion metric tonnes inferred, leaves Nigeria as modestly endowed with the mineral resource.

From 1916 to date, about 25 million metric tonnes of coal have been produced, with real production of 1 million metric tonnes per annum in the late 50's. This mirrors the glorious past of coal in sustaining and enhancing the economy, via the rail transport system, electricity supply and thermal domestic energy requirements of the young nation. Coal extraction and use in Nigeria, since after the 1950's represents a depression attendant on a country suffused with competing energy resources, but with an energy policy that is overtly skewed in favour of oil and gas. Coal remains largely a mineral resource for the future, given the current low-level utilisation trends.

This paper attempts a review of the relevance of the coal industry, employing the historical operational sub themes as a potent base for the future national economic activities that are likely to depend on that energy resource.

Key words: coal resource, energy policy, economic activities

1 table, 1 figure

PASSMA/022

B. DUROTOYE, 2003
Natural History Museum, Obafemi Awolowo University, Ile-Ife, Nigeria

Souring of raw materials for the building and construction industries in Nigeria

In: A.A. Elueze (ed.), Contributions of Geosciences and Mining to National Development, Nigeria Mining and Geoscience Society (NMGS), pp. 83-88

Summary

There is a very high demand for building and construction materials in a large and very rapidly developing country like Nigeria. The problem of sourcing manufactured materials for modern building and construction projects, is centered on the acute shortfall between demand and local supply of manufactured products (e.g. cements, paints, ceramic tiles and sanitary wares, glass, reinforcement iron and steel rods, roofing sheets etc). This shortfall is inevitably met through importation and high cost of the scarce foreign exchange.

Key words: raw materials, sourcing, strategies, improvement.

4 tables

PASSMA/023

A.A. ELUEZE, 1988
Department of Geology, University of Ibadan, Ibadan
Tel: 234-8023405898; *e-mail:* aa.elueze@mail.ui.edu.ng

Small scale investment opportunities in mineral-based enterprises in Nigeria

National Workshop on Small-scale Entrepreneurship in Nigeria, NISER/Friedrich Ebert Foundation, 39p.

Summary

The relevance of small-scale projects in the optimum development and exploitation of mineral resources, particularly with respect to rural growth, has been amply highlighted by various national and international bodies. In Nigeria, the Federal Government approaches to ore mineral and mineral fuels are generally well defined, compared to the industrial minerals. This is due perhaps to the fact that non-metallic resources commonly have low unit value, are labour intensive, and produced mainly for local consumption. Therefore, they would be better exploited by small-scale enterprises, possibly under the administration of either the state or local governments; as should be determined by some categorization, based on mineral type and/or operation scope. The latter arrangement would enhance the revenue of the relevant tier of government, and should eliminate or minimize the flourishing business of unlawful undertakings (Elueze, 1987). Newspaper reports suggest that the first group of illegal miners were only recently arraigned before a court. Joint ventures, within and between the private sector, the different levels of government and agencies like the NMC and the GSN, are obviously, desirable in view of the uncertainties of the minerals industry.

Key words: small-scale projects; rural growth; operation scope.

PASSMA/024

A.A. ELUEZE, 1989
Department of Geology, University of Ibadan, Ibadan
Tel: 234-8023405898; *e-mail:* aa.elueze@mail.ui.edu.ng

Trends in the development of small-scale projects on industrial mineral resources of Nigeria

National Workshop in Investment Opportunities in Small Scale Enterprises in Nigeria, NISER and Friedrich Ebert Foundation, Lagos, 39p

Summary

Occurrence of a wide range of industrial minerals are known in Nigeria. Some of these have been utilized over the years, particularly in buildings, constructions and domestic wares. However, the overall level of development and exploitation is inadequate, and significance to national growth is essentially defective.

Prospects for properly administered small-scale ventures in the non-metallic mineral sector, are high; due to the increasing demands for employment and better living, especially in rural areas. Other positive indices include the governmental policies to promote internal sourcing of raw materials, and privatization of enterprises. Notable areas for investment, comprise exploration, mining, processing and supply of various industrial minerals and rocks. In addition, are manufacture of abrasive, chalks and salts, plus production of ceramics, cosmetics, glass fabrications, dressed rocks and minerals.

The sustainable growth of these undertaking would require the availability of funds, local or adaptable technologies and suitable man-power. As in most developing countries, appropriate internal and external encouragement and support are accordingly desirable. It is therefore envisaged that this 2nd World Congress affords a worldwide appraisal of related issue and international organizations like the UNESCO and UNDP would provide relevant schemes, particularly with respect to training technical assistance.

Keywords: industrial minerals, enterprises, technologies, international organizations

PASSMA/025

A.A. ELUEZE, 1993
Department of Geology, University of Ibadan, Ibadan, Nigeria

Indications from Nigeria on the industrialization and employment potential of non-metalic mineral resources

AGID NEWS, No. 74/75, pp. 23-27

Summary

Worldwide, non-metallic minerals and rocks generally occur in relation to geological disparities. Despite their relative low level of development in Ngieria, there are prospects for ventures in exploration, mining, processing and distribution. Similarly, projects on abrasives, bricks, ceramics, chalks, cosmetics, polished stones and wares, have good investment potential.

The growth of the entreprises would invariably demand the operation of comprehensive minerals policy guaranteeing effective professional inputs, availability of adequte financial facilities and evolution of appropriate technologies. Positive consumption attitudes for domestic items, plus establishing an African network on goods and services, would provide further incentives to the envisaged economic propagation.

Key words: non-metallic mineals, projects, financial facilities, technologies, African network

1 table, 3 figures, 10 referencese

PASSMA/026

A.A. ELUEZE, 1995
Department of Geology, University of Ibadan, Ibadan, Nigeria

Prospects for sourcing stone-polishing ventures from rocks in the basement complex of Nigeria

Journal of Mining and Geology, Vol. 31, No. 1, pp.73-77

Summary

Various igneous and metamorphic rocks constitute the basement complex of Nigeria. They are composed of different proportions of felsic of mafic constituents. Textural characteristics are also wide ranging.

Disparities in petrographic attributes are generally portrayed in physical properties, notably strength, porosity, abrasiveness and aesthetic lustre. The melanocratic rocks such as dolerities, charnockites and amphibolites commonly have higher specific gravity, strength index and aesthetic quality, than the leucocratic ones which are however, often better exposed.

Based on petrographic and physical parameters, the majority hold good promise to be utilized for polished items. However, industrial exploitation may be constrained by a number of features, in some cases. On the other hand, sustaining viable rock polishing projects in Nigeria, would demand support for further geological appraisals, technical facilities, adequate capital and relevant manpower. Favourable regulatory and fiscal strategies are likewise required for long-term success of the envisaged enterprises.

Key words: basement complex, rocks, polishing projects, facilities

2 tables, 3 figures, 9 references

PASSMA/027

A.A. ELUEZE, 1998
Department of Geology, University of Ibadan, Ibadan, Nigeria

Promoting the development and exploitation of mineral resources in Nigeria

Proceedings of the First Mining in Nigeria Conference and Workshop, Ministry of Solid Minerals Development, Federal Republic of Nigeria, NIMAMOP, Global Minerals Limited, pp. 9-22

Summary

Economic minerals may be regarded as useful naturally occurring components of the earth. They essentially include rocks and minerals, and are generally categorised on the basis of style of occurrence and application, as metalliferous or ore minerals, non-metallic or industrial minerals and rocks, energy sources of fuels and water supplies. The scope and mode of their development and exploitation constitute a major index of the level of evolution and advancement of human societies. For instance, man's primitive structures and implements were commonly made from unrefined natural resources, notably rocks and minerals.

Projects and programmes like NIMAMOP and its offshoots are usually short-term, being normally targeted at specific concerns and goals. Therefore, the MSMD must maintain adequate backing to the GSN, the MD and the research efforts of related establishments and departments in the universities. As much earlier proposed, the GSN has to be duly restructured and should enjoy definite collaborative linkage with the Universities. In the prevailing circumstances, the departments of the MSMD must not be seemingly rendered redundant. Much of the NIMAMOP data were accessed or sourced from the GSN documents and publications. The propagation of its function through detailed mapping, exploration, drilling, enlarged sampling and analyses is evidently imperative for the improvement of records, especially in areas with scanty or doubtful information.

Key words: economic minerals, exploitation, programmes, collaborative linkage

2 tables, 7 references

PASSMA/028

A.A. ELUEZE and O.A. AKIN-OJO, 1993
Department of Geology, University of Ibadan, Ibadan, Nigeria

Functional characterization of talc bodies in southwestern Nigeria

Mineral Wealth, 85, pp.7-14

Summary

Talc bearing rocks occur in various localities in southwestern Nigeria, notably around Iseyin, Apomu, Ile-Ife, Ilesha, Esa-Oke and Odogbe. In each of these, talc is found in association with essential or minor quantities of tremollite, chlorite, anthophyllite, actinolite, serpentine and magnesite. On the basis of mineralogical compassion, four varieties may however, be differentiated. These are the talcose, tremolitic, chloritic, and anthophyllitic types, denoting the relative abundance of talc, tremollite, chlorite and anthophyllite, respectively. Each locality is found to contain more than one variety.

Abundances of major elements reflect the mineralogical variations SiO_2 values are generally highest in talcose samples (ca. 56,87%) and lowest in anthophyllitic types (ca. 45.67%). MgO contents are enhanced in talcose (ca. 30.14%) and anthophyllitic (ca. 30.65%) types; CaO in tremolitic specimens (ca. 6.8%). Al_2O_3 in chloritic varieties (ca. 7.26%) and Fe_2O_3 (ca. 10.03%) in anthophyllite-rich bodies.

All the varieties are assessed to be suitable for cordierite ceramics, rubber and roofing sheet manufacture. The talcose ones are found to be adequate for electrical insulation ceramics, paints, paper, cosmetics, textiles,

pesticides, fertilizers, plastics and refractories. Tremolitic types commonly meet specifications for wall tile and dinnerware ceramics. However beneficiation is necessary, especially the removal of iron-rich minerals by magnetic floatation, to enhance the suitability of the samples for each application.

Key words: talc, ceramics, refractories, beneficiation, paints.

5 tables, 1 figures, 4 references

PASSMA/029

A.A. ELUEZE and F.A. AWONAIYA, 1987
Department of Geology, University of Ibadan, Ibadan

Investigation of talc bodies in Iseyin area, southwestern Nigeria, in relation to their application as industrial raw materials

Journal of Mining and Geology, Vol. 25, Nos. 1 & 2, pp. 217-225

Summary

Talc-bearing units occur as relatively small bodies in the Iseyin district. The enclosing and related assemblages comprise quartzites, biotite-garnet/staurolite schists and amphibolites. In addition, tourmaline – quartz veins are found within some outcrops. Samples of the talcose rocks may be schistose, weakly foliated or massive in character, and their essential constituents in varying proportions, are commonly talc, tremolite and chlorite. These components are usually distinctive on X-ray charts which may likewise record some alteration minerals.

Abundance of elements especially Al_2O_3, Fe_2O_3 (total) and CaO, commonly reflect mineralogical variations. However, K_2O, Na_2O and P_2O_5 contents of the talcose samples are generally low. Evaluation of petrographic and chemical data, plus some industrial indices indicate that the different sample types can be suitable raw materials for some industrial applications including ceramics, paper, rubber and textiles. In most cases, samples would require appropriate processing or blending to attain desirable qualities. On the other hand, mineralogical and chemical analysis of residual soils suggest that the Iseyin bodies may be more extensive in occurrence, than as indicated by their exposure.

Key words: assemblages, mineralogical variation, blending.

3 tables, 5 figures, 7 references

PASSMA/030

A.A. ELUEZE and A.O. OKUNLOLA, 2003
Department of Geology, University of Ibadan, Ibadan

Potential for rock polishing enterprises in southwestern Nigeria

In: A.A. Elueze (ed.), Prospects for Investment in Mineral Resources of Southwestern Nigeria, NigerianMining and Geosciences Society (NMGS), pp. 55-59

Summary

Various igneous and metamorphic rocks constitute the basement complex, especially much of southwestern Nigeria. They are composed of different proportions of felsic to mafic constitutions. Textural characteristics are also wide ranging.

Disparities in petrographic attributes are generally portrayed in physical properties, notably strength, porosity, abrasiveness and aesthetic lustre. The melanocratic rocks such as dolerities, charnockites and amphibolites commonly have higher specific gravity, strength index and aesthetic quality, than the leucocratic ones which are however, often better exposed

Based on petrographic and physical parameters, the majority holds good promise to be utilized for polished items. However, industrial exploitation may be constrained by a number of features, in some cases. On the other hand, sustaining viable projects in ornamental stones, would demand support for further geological appraisals, technical facilities, adequate capital and relevant manpower. Favourable regulatory and fiscal strategies are likewise required for long-term success of the envisaged enterprises.

Key words: basement complex, ornamental stones, enterprises.

2 tables, 2 figures, 7 references

PASSMA/031

A.A. ELUEZE and O.A. OKUNLOLA, 2003
Department of Geology, University of Ibadan, Ibadan

Industrial projects in non-metallic minerals in southwestern Nigeria

In: A.A. Elueze (ed.). Prospects for Investment in Mineral Resources of Southwestern Nigeria, NigerianMining and Geosciences Society (NMGS), pp. 27-39

Summary

Industrial mineral and rock occurrence are found distributed within diverse geological setting. In southwestern Nigeria, the Precambrian suite and the Cretaceous – Recent sedimentary sequences are the major rock units which host a broad variety of industrial minerals, including limestone, marble, talc, kaolin (clays), sillimanite, phosphorite, glass sands, gypsum, dimension stones, construction aggregates, quartz, feldspar and mica. Others are sands, gravels and laterites.

Occurrences of talc for example, are found around Ife-Ilesha, Esa-Oke, Baba-Ode, Iseyin and Apomu. Four main varieties namely talcose, tremolitic, chloritic and antophillitic are known. Residual and sedimentary kaolinitic clay bodies which are developed above migmatitic gneiss and Cretaceous sedimentary sequences respectively occur notably around Isan, Ijero, Abeokuta, Kitibi-Ayedade, Imope and Onibode. Dolomitic marble occur as lensoid bodies notably around Igbeti and Omuaran area, while sedimentary limestone are known to prominently occur around Ewekoro, Sagamu and Igbokoto.

The tonnage and grade of these minerals are highly variable. However, this does not obliterate the enormous potential of these minerals as important raw materials for varying industrial projects in which they have been indicated. Such industries include paint, paper, ceramics, rubber, chemicals, plastics and cement where the clay, talc and limestone have been found useful as fillers and extenders.

Other mineral occurrences such as glass sands at Igbokoda, sillimanite at Obafemi and Olujuoro, phosphate at Ilaro and gypsum at Igbokoto could also b e found useful as raw materials in glass refractories, agricultural and cement industries.

The proper utilization of these mineral resources will however depend on proper exploration, evaluation, mining and processing procedures. Despite the prevailng low capacity utilization of many industries and near absence of export activities in the industrial minerals sector, the present democratic dispensation may serve as an encouraging impetus for investment in the solid minerals.

Key words. minerals, geological setting, limestone, aggregates, glass, refractories.

1 figure, 10 tables, 32 references

PASSMA/032

R.W. EVELETH, 1983

Heap leaching for gold: a case history of new methods for working an old mine

AGID Guide to Mineral Resources Development, p.303

Summary

The Cooney (Mogollon) mining district is located in western New Mexico, southwest Catron Country. Access to this remote district is via U.S. 180 and N.M. 78. The area, due to its isolation, has never had rail service, although plans were made at various times to construct lines from Silver City, 130km south of Magdalena, 210km northeast. During the early days of the district (1880 – 1900), the raw ore was shipped to a smelter by freight wagon at $50 per tons (Thompson, 1962), virtually preventing any large scale production until milling facilities were constructed locally around 1900 (Allen, 1909).

Steady until 1914 when annual production peaked at $1.5 million (Ferguson, 1927), when operations ceased in 1926, due to rising costs and diminishing profits, the Cooney district had produced more than 15 million ton of silver, gold, and copper at a time when the price of silver averaged less than $1.00 per ounce. Operations resumed again in 1931. Because of new orebodies (although lower grade), efficient management, and an increase in metal prices, these operations were successful for another 11 years. An additional $5 million of ore was produced during this period (Thompson, 1962).

Keywords: Cooney district, increased operation, efficient management, increase metal prices

2 tables, 5 figures

PASSMA/033

W.C. FAIRBAIM, 1983

Mining and marketing diamonds and some other precious stones

AGID Guides to Mineral Resources Development, Vol. 18, p.357

Summary

Mining for diamonds is an important industry in a number of African and South American countries. In Sierra Leone, Liberia, Ghana, Central African Republic, Zaire, Venezuela and Brazil, it is an important source of employment for many thousands of people. However, their mining and concentrating methods are wasteful and the smuggling of diamonds out of the country is common. In South Africa, Zaire, Botswana, Lesotho, Namibia and Tanzania highly sophisticated mining and concentrating techniques are employed in the diamond mining operations. This has resulted in considerable infrastructural development and has been of great significance as a source of government revenue.

Various prospecting techniques are used depending on the scale of operations. The most common methods is by pitting and examining the concentrates for heavy minerals, and operations in the Sierra Leone are described to illustrate the system.

In many African countries the Government has a controlling share in the equity of the company, which has been obtained by outright purchase or in some cases given free of consideration by the mining companies concerned. The export tax on diamonds is discussed country by country, and it is suggested that it should be kept as low as possible to discourage smuggling. Diamond exporting should be competitive and the setting up of a single government marketing system has seldom worked successfully.

South Africa controls a large part of the world's production of diamonds. This concern has provided a high degree of stability to diamond prices, which otherwise would be extremely volatile.

Key words: diamond, mining, sophisticated, techniques, marketing

5 tables, 6 figures

PASSMA/034

R.B. FINKELMAN, G. L. FEDER, and W.H. OREM, 1991
U.S. Geological Survey, Reston, VA 22092

Relation between low-rank coal deposits and Balkan endemic neptropathy

AGID NEWS, No. 65, p.23

Summary

The relation between geologic materials and human health and disease has been the subject of numerous studies. Much of the attention has been focused on health problems caused by either excess intake or trace elements (for example, selenium and lead) or trace elements deficiency (for example iodine and magnesium). One aspect that has received relatively little attention has been diseases caused by the release of naturally occurring toxic organic compounds into the environment. In the Balkan countries of Yugoslavia, Romania, and Bulgaria, we believe that such a relation may occur between organic compounds leached by groundwater from shallow lignite deposits and the disease known as Balkan endemic nephropathy (BEN).

BEN, which has been recognized by the medical community since 1956, is a progressive kidney disease that leads to death from kidney failure or to a lifetime on dialysis. As many as 40% of the people who suffer from BEN also develop cancer in the urinary tract region. In a study supported by the US-Yugoslav Joint Fund for Scientific and Technology Cooperation, a multinational interdisciplinary team including the authors, has been studying the disease.

Key words: geologic, health, diseases, organic shallow, leached, groundwater.

PASSMA/035

F.E. FRIMMEL, 2002
Department of Geology, University of Cape Town Rondebosch 7701, South Africa.
E-mail: lief@geology.uct.ac.za

Sediment-hosted base metal sulphide deposits in Neoproterozoic strata of Namibia

SGA News, November, p.14

Summary

Neoproterozoic sedimentary successions of the Pan-African Damara and Gariep Belts are some of the most important hosts of economic base metal concentrations in southwestern Africa. Two major types of deposit are distinguished, the Tsumeb- (including the Berg Aukas-) type and the Rosh Pinah-type. These two have been compared with MVT and SEDEX deposits, respectively. Both types have in common that Neoproterozoic shallow marine carbonates played an important role as chemical trap for the ore fluids. The recent surge in chemostratigraphic data (Folling and Frimmel, 2002; Hoffman et al., 1998) on these carbonates, together with new age constraints (Folling *et al.*, 2000; Kamona *et al.*, 1999). Make it feasible to compare the geological, tectonic and climatic conditions during mineralisation and thus the principal controls on the formation of these deposits. Based on that, the widely held notion of MVT and SEDEX deposits having a similar genesis will be critically assessed.

Key words: chemical trap, ore fluids, chemostratigraphic data, tectonic.

PASSMA/036

I. GARBA, 1998
Department of Geology, Ahmadu Bello University, Zaria

Geological outlook and gold potential of Nigeria

Proceedings of the First Mining in Nigeria Conference and Workshop, Ministry of Solid Minerals Development, Federal Republic of Nigeria, NIMAMOP, Global Minerals Limited, pp.41-57

Summary

Nigeria is situated within the Late Proterozoic-Early Palaeozoic (Pan-African) terrane which was formed 500 ± 100 million years ago. Gold occurrences are known in the western half of the country from Ilesha area in the southwest through the Minna-Birnin Gwari area to the Anka-Maru area in the northwest. Despite its history of gold production, Nigeria is yet to benefit from the recent incursion of gold exploration and mining investment into the West African sub-region. This is perhaps due to the lack of understanding of the Nigerian Precambrian geology, and the perception by many that the Pan-African terrane is far less prospective to gold when compared with the older geological terranes in West Africa. West African countries like Ghana, Cote d'Ivore, Mali, Burkina Faso and Niger have all benefited from the recent foreign investment in gold mining, essentially due to the fact that they are underlain by Early Proterozoic rocks of about 2,000 ±100 million years old. Such rocks are known to have potential for the discovery of large gold deposits in other parts of the world. However, recent studies of the Nigerian terrane have shown that favourable geology exists for the discovery of world-class gold deposits compared to those found in other parts of West Africa. The Nigerian terrane is practically unexplored for gold and that explains why no large deposits are known in the country to date, despite the geological endowment.

Mineral endowment is the foundation of any mineral industry. If a country is known to be endowed with a mineral resource, the development of mines is only achieved through exploration. A favourable geology and enduring exploration activity are required to finds out whether or not the potential exists in a given country for the discovery of particular mineral deposits.

Many countries in West Africa are known to be gold producers or to have potential to produce gold. But Nigeria is not usually listed as a gold producer or as a country with considerable potential for gold, despite some history of gold production. This paper assesses the Nigerian terrane within the geological framework of West Africa and evaluates whether or not the potential exists for the discovery of large gold deposits.

Key words: Pan-African, gold, mining, production

5 figures, 20 references

PASSMA/037

R. GHOSH, B.N. SING and D. DEVBHUTI, 1993
Centre for Mining Environment, Indian School of Mines, Dhanbad, India

Biological land reclamation in mining areas: an attempt to generate a working model

AGID NEWS No 72/73, p.18

Summary

The formation of land depressions through excavation is inherent in the very process of opencast coal mining. The extent of land damages varies from 4 ha to 110 ha per million tonnes of coal extracted, depending upon seam thickness and overburden-to-coal ratio.

Ideas have been developed on "conditions and concurrent reclamations" (Coates, 1981; Ghosh and Ghosh, 1990) by working in small sectors in a planned way and backfilling each pit successively. But this can only achieve a way to "biological land reclamation" if the topsoil of the area to be mined, is excavated separately and

stored with a means to protect its biological content. This very basic requirement does not happen to be practicable even today in many mining areas over the globe, due to various practical constraints. At best what can be achieved is backfilling of the void by some excavated materials which, in most cases, do not bear sufficient amount of humus or soil nutrient suitable for growing greenery.

One such long narrow strip of land, approximated 1 ha in area, was provided by Bharat Coking Coal Limited, India, for experimental plantation to attempt biological land reclamation (without adding any topsoil), under a project sponsored by the Eastern Regional Centre for Wastelands Development Programme (ERCWDP – sponsored by national Mission on Waste-lands Development, Ministry of Environment and Forests, Government of India) by a group of scientists of the Centre of Mining Environment (CME – also sponsored by the Ministry of Environment and Forests), at the India Schools of Mines (ISM), Dhanbad, Eastern India.

Keywords: mining, revegetation, reclamaiton, greenery, India

6 figures, 5 tables

PASSMA/038

Q.A. HALIM, 1996
Public Works Department, Ministry of Development, Berakas 2060, Brunei Darussalam

Limestone survey for development in Bangladesh

Geoscience and Development, No.3, p.21

Summary

Limestone is an important industrial mineral for the economic and industrial development of a country. A most important use is for the production of Portland cement, for which purpose it is mixed in definite proportions with certain clays. Limestones are used as fluxes in metallurgy, in agriculture (for soil liming), for the production of lime for building work, and are used in roads, railways and stone construction.

In Bangladesh, commercial quantities of limestone are not available at the surface, but are found at mineable depth only at Tagarbat, Sylhet Province. So it was a great and valuable event when thick beds of limestone were encountered in the well Kuchma-1, at Bogra, between 1770m and 1967m. Basaltic trap tock was found below, at 22310-2380m depth. This discovery helped to prepare a project with the purpose of finding a deposit at mineable depth.

Geological surveying for older formations in Bangledesh, is complicated by thick deposits of alluvium of the Ganges and Bramaputra Rivers. Most of the Bangledesh is situated in the deltaic region of these two rivers, the Bengal Delta, which is about twice the size of the Mississippi delta and forms a part of the Bengal Basin. In the north it is bordered by the Shillong Plateau, and in the west by the Indian Shield. Geologically older rocks, of Tertiary age, are exposed at the surface only in the eastern part of the country, in the eastern part of the country, in the Chittagong Hill.

Key words: limestone, alluvium, mineable depth, metallugy

PASSMA/039

J.S JENNINGS, 1999
International labour Office, Geneva

Child labour in small-scale mining: examples from Niger, Peru and Philippines

SAP 2, 78/WP, 137

Summary

The three case studies in this working paper were commissioned as part of the preparatory work for a tripartite meetings on *Social and labour issues in small-scale mines*, held in Geneva on 17-21 May 1999. Some of the information in them was included in the report that was prepared for the meeting. The three situations described here, in Niger, Peru and the Philippines are each fairly typical of their region.

Key words: child labour, productivity, agencies, livelihood

6 figures, 10 tables

PASSMA/040

A. JEROME, 2003
Department of Economics, University of Ibadan, Ibadan, Nigeria

Preparation of investment profiles for ventures in mineral resources

In: A.A. Elueze (ed.), Prospects for Investment in Mineral Resources of Southwestern Nigeria, NigerianMining and Geosciences Society (NMGS), pp.107-110

Summary

Exploitation of mineral resources has assumed prime importance in several developing countries including Nigeria. This paper treats the preparation of investment profiles for ventures in mineral resources. Specifically, it appraises project identification and planning, prescription of investment profiles and sources of funds. The study reveals that minerals rich economies as a group, have had lower rates of growth and structural transformation, especially in comparison with resource deficient developing countries, due to a legacy of hard policies. This phenomenon had been called the *resource curse*. The need to articulate well-structured investment profiles becomes apparent. The essential components are rigorous feasibility analysis, clear definition of objectives and management of risks.

Key words: investment profiles, project identification and planning, sources of funds.

3 references

PASSMA/041

S. KUEHN, J. OGOLE and P. SANGO, 1990
Department of Applied Geology, Free University Berlin, Wichernstr. 16, 1000 Berlin 33, Germany

Regional setting and nature of gold mineralization in Tanzania and southwest Kenya

Precambrian Research, Vol. 46, pp. 71-82

Summary

The most productive gold deposits in Tanzania and southwest Kenya are in the Nyanzian greenstone belts (2700 Ma) and the Ubendian System (2000 Ma). The deposits occur in the form of massive or dissemination Fe-sulphide-rich bodies in banded iron formation (BIF) or tuffs, mineralized shear zones in mafic rocks and shear-zone-controlled quartz reefs. Mineralization is mostly interpreted as epigenetic, although for some deposits, a syngenetic origin is possible. There are also base-metal-rich massive sulphide deposits of probable syngenetic origin in the Nyanzian greenstone belts. Iron-rich mafic rocks are the most favourable hosts in the lower Nyanzian belts as well as in Ubendian System. Whereas BIF is the dominant host rock in the upper Nyanzian System. To date about two-thirds of the gold production has come from shear-zone-controlled mineralization, and about one-third from stratiform-stratabound deposits.

Key words: mineralization, gold, strata-bound deposits, banded iron formation, greenstone belt

3 tables, 2 figures

PASSMA/042

E.J. LANGEVAD, 1983
7 E Bayview Towers, 20 –22 Onslow Avenue, Elizabeth Bay, Sydney NSW 2011, Australia

Management of small and medium scale metalliferous mining projects

AGID Guide to Mineral Resources Development, pp. 245

Summary

The small and the medium sized mines as are now called, constituted the great majority of mining enterprises in the earlier part of this century and they established a management style which was appropriate to those times and conditions. A new situation has arisen because the increased demand for metal could only be filled by the development of the large disseminated low grade mineral deposits and now the small and medium sized mines are relatively far less important. Their impact on the economy of many countries, however, can be crucial so the question of ensuring their effective management is of concern both to the industry and to governments.

The new low-grade mines had to be worked on a large scale and new technologies had to be developed to make these projects viable. The whole of the mineral industry has, in fact, become a far more complex entity than it was in the heydays of the small and medium sized mines. To cope with this situation, the management of most mineral enterprises had had to call on a wide range of technical expertise and they have become elaborate and expensive organization.

Key words: mining, management, industries, improved technologies.

PASSMA/043

E. LEDGERWOOD, 1982
Director, Mackay and Shnellman Limited

Practical ideas on small scale mining potential

AGID NEWS, No. 30, pp.3-8

Summary

Analysis of geological environments and miningin Ghana is given to propose concrete practical ideas on small mines potential, types of mining, application of intermediate technology, equipment and working in mines, with their limitations, problems and solutions. The need for a small mines programme with funds for basic research and staff to advise and train presonnel, is emphasised.

Key words: mining, equipment, funds, basic research

1 figure

PASSMA/044

F.M. LEWIS, J. C. PIERCE, G.M. POTTER and R.B. BHAPPN, 19883
Mountain States Mineral Enterprises, P. O. Box 17960, Tucson, Arizona, 85731, U.S.A.

Technology and economics of small mines: mining

AGID Guide to Mineral Resources Development, p.267

Summary

Although the public view of mining in the last two decades has been focussed on the giant mineral extractive enterprises, the small miner (individuals and small groups) continue to quietly make a vital contribution to the

world exploration for, and supply of, essential mineral commodities.

Even in highly developed United States of America, a 1980 census of minerals industries showed that 75 percent of all mining operations employed fewer than 20 persons. And in the U.S.A. "mining state" of Colorado, in 1980 there were 196 operating mines of which 182 (93 percent) of them employed fewer than 50 people while 158 (81 percent) of them employed less than 10 people. It is true that most, if not all, of the major producing mineral deposits and districts over the globe were discovered by independent prospectors and were, in many cases, first exploited by enterprises employing from one to 50 persons. In many under-developed nations, most production of mineral wealth is currently from small operations that constitute the discovery and initial development of mineral provinces and mining districts that, in many cases, will become the large mines and the major producers to supply the future requirements of expanding mineral and metal consumers.

Key words: mining, small operations, initial development, mineral, metal, consumers.

PASSMA/045

M. LOGAN, 2004
International Development Research Center New York, USA.

Making mining work: bringing poverty-striken, small-scale miners into the formal private sector

Global Policy Forum, July, 12, New York, USA

Summary

Thousands of miners are reportedly digging for gold in the Las Cristinas mine in Venezuela's Bolivar State – but few of them actually work for mine owner, Toronto-based Crystallex. Instead, it is estimated that 87% of the workers are engaged in artisanal or small-scale mining (ASM). They scratch out a living independently or alongside their spouse and children; some families have been built wooden or plastic houses underground.

The miners moved in when former Las Cristinas owner Placer Dome, also of Canada, stopped developing the mine in 1999 because of low gold prices. Up to now, the multinational has no officially stated position regarding the incursions and settlement by illegal miners.

The miner's story is not uncommon. In fact, digging for precious minerals in precarious, often unhealthy conditions, without safety equipment, proper tools, or recognition from the state is a way of life for about 13 million of the world's poorest people in Latin America, Africa and Asia.

Key words: artisanal, poverty, families, gold, safety.

2 tables, 3 figures

PASSMA/046

J.O. MAKOJU and O.R. OZOEMENA, 2003
National Electric Power Authority (NEPA), Federal Capital Territory, Abuja

Coal utilization for power generation in Nigeria

In: A.A. Elueze (ed.), Contributions of Geosciences and Mining to National Development, Nigeria Mining and Geoscience Society (NMGS), pp. 75-82

Summary

Nigeria is endowed with abundant coal resources; with a production reserve of 650 million tonnes, while inferred/estimated resource stands at about 2.75 billion tonnes. The per capita consumption of electricity in any

country is a socio-economic index. The present per capita consumption of electricity in Nigeria is 0.05KW which falls short of requirement for meaningful development. Despite the fact that the year 2000 marked a lot of turning point in the history of electricity industry, the gains were at a verge of erosion. This brings to the fore the fact that the country's energy mix proportion is not balanced, with a lot of emphasis on hydrocarbon.

Re-introduction of coal as a source of power generation using clean-cool technology, will boost coal demand in the electricity generation sector and consequently make more energy available. The main challenge facing the nation today is how to harness her energy resources for sustainable economic growth and development.

Key words: coal resources, technology, harnessing, energy, sustainable, growth

1 table, 12 figures

PASSMA/047

S. MALOMO, 2004
Geological Survey of Nigeria Agency, Abuja.

Geological survey, mineral exploration and the challenge of barefoot experts

University of Ibadan Postgraduate School Interdisciplinary Research Discouse, the Postgraduate School, University of Ibadan, Ibadan, Nigeria, 44p.

Summary

In this paper, we have provided a synopsis on Geological Surveys, mineral exploration and the challenge of barefoot experts. We have emphasized the basic roles of the Geological Survey of Nigeria in the provision of geoscientific information for economic, social and environmental development. Apart from their traditional roles of providing geological maps, a modern geological survey is expected to embrace the acquisition, management, storage, interpretation and communication of geosciences information, so as to promote resource potential and encourage investment in detailed mineral exploration by the private sector. However, the Geological Survey Departments have not been able to carry out these obligations successfully, due to many reasons including wars, militarism, and lack of fund, management and administrative bottleneck.

Large areas of Nigeria have not been mapped in detail. Many of the geological and geophysical information available currently are outdated. In fact, none of the mineral targets identified in Nigeria to date represents unequivocal world-class targets of immediate interests to investors. This is so because the Geological Survey Departments carried out little or no mapping and mineral exploration for more than fifteen years now. Hence, there is an acute shortage of useful data and information what would allow investors to make informed decision on the merit of investment and reduce their risk.

The Geological Survey of Nigeria Agency intends to incorporate research and capacity building into key areas that have been identified through interactions with Universities, Polytechnics and Monotechnics. Also, all tiers of government engaged in mineral exploration are enjoined to assist involving a rapid approach to mapping of the country, through a national Geological Development Programme.

Key words: geological maps, surveys, minerals, resource investment.

10 figures 12 tables

PASSMA/048

M. MAPUTO, 1991

Mineral Deposit Monitoring, Maputo, Mozambique

AGID NEWS, No. 67/68, p.35

Summary

A ten-day course on "Mineral deposit Modelling" was held in Maputo, Mozambique, May 27-June 6, 1991, for in-service geologists in Unviersidade Eduardo Mondlane (UEM) and Ministerio dos Recursos Mineraias (MIREM) under the auspices of the Commonwealth Special Fund for Mozambique. Professor U. Aswathanarayana, Commonwealth Visiting Professor, designed the course and prepared a course manual (160 pages). Locally based resource persons presented some Mozambiquian case histories.

There is a close parallelism in the geological environments, and therefore of mineral potential, between South Africa, Zimbabwe and Mozambique. There are several reasons for the under-development of the mineral sector in Mozambique and lack of trained personnel undoubtedly constitutes an important constraints.

The course was aimed at using mineral deposit models to design strategies of exploration and development, by an understanding of the linkages between the scientific and technological aspects of mineral resources of Mozambique with their value-added processing and marketing (including introduction to the preparation of bankable techno-economic reports).

Key words: mineral deposit, modelling, geological environment, potential

2 figures, 2 tables

PASSMA/049

E.I. MBEDE, 1991
Technical University of Berlin, SFB 69, Ackerstrasse 71 – 76 1000 – Berlin 65, FRG

Women in geoscience

AGID NEWS, No. 66, p.3

Summary

The planned International Workshop on "The Role of Women Geoscientists in Development" sounds to be a good idea. This is because the role of women in geosciences is vast; it includes day-today harnessing of nature, protection of the environment, fighting natural hazards, as well as all the women geoscientists working in geoscientific institutions. This probably true in most developing countries where the responsibility of women in society is still vast and is stipulated by the cultural values we have inherited from our ancestors. Experience expressed by the British Voluntary Service Overseas (VSO) in the role of women in maintaining water well in the villages of the third world gives quite a good example (AGID News, No. 63/64, p16)

The proposed workshop would provide a good chance for geoscientists working in different parts of the world to come together and exchange ideas on how they can harness the knowledge they have, in an effort to raise the living standards of women and children. This can particularly be true for those working in the remote areas of the third world where earth resources are available but are not properly exploited. The idea of making women participate in simple geoscientific projects or teaching them to use locally available materials to raise their living standards is probably a good approach.

Key words: role, women, geoscientific development, raising, living, standards, remote areas, third world

5 tables 2 figures

PASSMA/050

H. MIKE, 1991
Earth Resources Centre, University of Exeter, North Park Road, Exeter EX4 4QE, UK

Impact of mining on tropical forest

AGID NEWS, No. 67/68, p.32

Summary

An investigation of the impact of mining on tropical forest in central India being undertaken by the Earth Resources Centre (ERC), University of Exeter, UK, and the Visvesvaraya Regional College of Engineering (VRCE), Nagpur, India (see AGID News No. 61/62, February/May 1990, pg. 9) is now in its first full field seasons. An initial reconnaissance visit during December 1991 by Anand Paithankar and Ishwardas Muthreja of VRCE and Mike Heath of the ERC, will be followed by a more detailed sampling progromme by the ERC's John Merefield and Ian Stone in February 1992, analytical work is being carried out in both Exeter and Nagpur.

The field season began with visits to the two mines that are forming the main focus of the study: the Malanjkhand Copper Project, Madhya Pradesh, and the Dongri Buzurg Manganese Mine near Tumsar, Maharashtra. The Malanjkhand copper mine is one of the largest mines in Asia and is adjacent to tropical forest that is contiguous with the Kanha National Park; the Dongri Busurg manganese workings is an extended belt running from north of Balaghat to the Nagpur area.

Key words: impact, mining, tropical forests, earth resources, reconnaissance, sampling, mines, copper, manganese.

2 tables, 7 figures

PASSMA/051

N.F. MPHEPHUS and M. J. VILJOEN, 2002
Centre for Applied Mining and Exploration Geology, School of Geoscience, University of the Witwaterstrand P/Bag X3, Wits; 2050 Tel: (011) 717-6571, Fax (011) 339 – 1697 e-mail: 065dweli@cosmos.wits.ac.za

Environmental aspects associated with past, present and future mining of the central Rand

Summary

Since the discovery of gold in the Central Rand in 1886, up to and including the present, mining activities has been the backbone of economic development in the Johannesburg area. This has happened in stages, from earlier underground mining, present reclamation of gold-bearing mine tailings to the potential future mining of remaining deep and shallow gold resources. These activities have impacted and will continue to impact on the environment on the Central Rand. This paper evaluates environmental impacts of these stages of mining on the Central Rand.

Key words: environmental impacts, mining, pollution, reclamation, job creation

3 figures,6 tables, 4 references

PASSMA/052

P. MUNDIA, 1994
Chaipazuba Co. Ltd., P. O. Box 310265, Lusaka, Zambia

Women in small-scale mining in Zambia

Geoscience and Development, No. 1, pp. 12-13

Summary

With the increasing awareness of the importance and value of gemstones, a number of women have begun to enter this area of activity which was previously dominated by the menfolk. Women will find it difficult to make a break-through in this technical field, unless the problems which are mentioned in this paper are addressed by the appropriate authorities.

Key words: environmental, impacts, mining, pollution, reclamation, job creation

3 figures, 6 tables

PASSMA/053

C.O. NJOKU, 2003
Projects Development Institute (PRODA), Enugu

Coal resources of Nigeria: the Orukpa coal field as a case study

In: A.A. Elueze (ed.), Contributions of Geosciences and Mining to National Development, Nigeria Mining and Geoscience Society (NMGS), pp. 63-74.

Summary

The history of the coal industry in Nigeria is typically oscillatory in nature. Coal production peaked at about 900,000 tonnes in 1988, from a little more than 20,000.00 tonnes at the start of mining in 1916. It started declining in 1970 to a low in 1983.

Recent events like the world wide energy situation, the drop in foreign exchange, and NEPA's inability to supply enough power from the existing hydro-electric dams and gas station, is trying to force the nation to adopt a strong coal policy that will call for more coal for domestic use, export and establishment of more coal based thermal stations. There is also the need for improved blending process of coal with imported ones for use at Ajaokuta steel plant and conversion of existing cement industries from oil/gas to coal burning.

These steps will enhance coal productivity to a projected high of over 8 million tonnes by 1990. The above speculation calls for effective management of existing mines, and locations of more sources of coal. An extension of Orukpa open cast mine, was investigated by a well-articulated drilling programme and a total of 313,706 tonnes of coal was estimated as reserve. The geology was very closely studied and the existing structures mapped.

Key words: Orukpa coal field, effective management, enhance productivity.

6 tables, 5 figures, 13 references

PASSMA/054

J.I. NWACHUKWU, 2003
Department of Geology, Obafemi Awolowo Unviersity, Ile-Ife

Exploitation of the bitumen deposits of Nigeria

In: A.A. Elueze (ed.), Prospects for Investment in Mineral Resources of Southwestern Nigeria, NigerianMining and Geosciences Society (NMGS), pp. 67-74.

Summary

Nigeria's vast deposits of natural bitumen (or tar sands) are located in southwestern Nigeria in parts of Ogun, Ondo and Edo States. The estimated reserves are 30 – 40 billion barrels of heavy oil in place with future potential recovery of 3654 x 106 – bbls. Because of the Federal Government's desire to diversify the nation's economic resource base, the Bitumen Committee was set up to oversee the economic exploitation of this natural resource. Through the pioneering efforts of the Geological Consultancy Unit of the University of Ife (now Obafemi Awolowo University) in the early 80's, lot is now known of the tar sands of southwestern.

Like any other mined mineral resource, the development of tar sands deposits is associated with many environmental problems. These range from rehabilitating the displaced farmers and inhabitants to cleaning up of contaminated soil, water and air. The water produced with the oil contains a lot of toxic heavy minerals which must be disposed of adequately. Also the sludge left behind in extraction of bitumen from open-cast mining contains clay and a lot of minerals which are difficult to remove. Since the development of Nigeria's bitumen deposits is in its infancy, the need for baseline and/or environmental impact assessment studies is imperative.

Government should come up with detailed policies and guidelines on environmental issues, in order to avoid the sad experience of the Niger Delta and Jos Plateau regions of Nigeria.

Key words: Nigeria, tar sands, environmental problems, government policy, guidelines

1 table, 6 figures, 25 references

PASSMA/055

M.I. ODIGI and C.O. OFOEGBU, 1989
Faculty of Science, University of Port Harcourt, P. M.B. 5323, Port Harcourt, Nigeria.

Distribution and geology of non-metallic minerals in Nigeria

In: C. O. Ofoegbu (ed.), Groundwater and Mineral Resources of Nigeria, Fried. Vieweg and Sohn, Braunschweig/ Wiesbadan, pp. 141-159

Summary

A study of the distribution, geology and genesis of non-metallic minerals in Nigeria, has been carried out. non-metallic minerals appear to be distributed in the major geological rock areas of Nigeria – sedimetnary and basement complex rocks. Significant deposits of limestones, clays, glass sand and gravels, all of commercial importance are known to occur within the Cretaceous to Recent sedimentary environments while phsophates, gypsum, salts, nitrates, diatomites, fluospars and barytes are thought to occur in the Cretaceous – Tertiary sedimentary basins of Nigeria and are therefore presently being sought for and investigated. Occurrences of talc, asbestos, graphite, marble, dolomite and kaolin clay are associated with the schist belt of southwestern Nigeria, the hydrothermally altered and weathered rocks of the Younger Granites and the basement rocks of Nigeria. Other minerals which occur in uncommercial amounts in Nigeria, include sillimanite, kyanite, nitrates, pumice and puncite.

Key words: non metallic, minerals, basement complex, sedimetnary basins

8 tables, 3 figures, 6 references

PASSMA/056

A.B. OFULUME, 1993
National Steel Raw Materials Exploration Agency, P. M. B. 2440, Kaduna.

An assessment of the suitability of the Jakura marble for use as flux in steel making

Journal of Mining and Geology, Vol. 29, No. 1, pp. 1-6

Summary

The Jakura marble deposit lies 13 kilometres west of Jakura village and 56 kilometres northwest of Lokoja, Kwara State, Nigeria. The marble is sandwiched between gneisses of the Precambrian basement complex of south western Nigeria. It is medium-coarse grained and ranges in colour from white to light grey to blue grey, with dominance of the coarse grained white variety.

Chemical analysis of the marble using X-ray fluorescence (X.P.F) spectrometry indicates a very high chemical purity ($CaCO_3$% 98.70). The marble was calcined through a range of temperatures 950, 1000, 1050, 1100°C for ninety minutes in laboratory muffle furnace and the quality of the lime was then tested by investigating such properties such as apparent porosity, bulk density, decapitation, mechanical strength, loss on ignition, surface area and reactivity with water. The lime calcined at 950 and 1000°C was soft burred and has high surface area (>3m²/g) and high reactivity (>12°C raise after 2 minutes). At 1100°C the lime was deadburned and showed

very low reactivity with water (6°C). The problem is the weak nature and coarse texture of the marble, which give rise when calcined to a lime that highly decrepitates (>10%), crumbling into fines. Therefore commercial lime manufacture from it necessitates the use of either the gas suspension calciner of the fluor-solids kiln with fluidized bed system.

The lime fines shall have to be agglomerated and briquetted to facilitate its fluxing application in steel making especially in the BOF process of Ajaokuta Steel Company Limited. The marble is strongly recommended for this purpose.

Key words: gneisses, XRF, mechanical strength, time, fluidized bed

5 tables, 6 figures, 3 plates, 7 references

PASSMA/057

P.O. OGAZI and B.A. ADEGBESAN, 1993
Raw Materials Research and Development Council, 28 Berkely Street, Lagos, Nigeria

The metallic mineral Industry in Nigeria: prospects for future development

AGID NEWS, No. 74/75, pp. 27-31

Summary

The base-metal, iron and steel and engineering services sector is strategic to the industrial and technological development of Nigeria. The logical conclusion of the development of this sector is the establishment of an industrial-military complex for the country.

A thorough assessment of the occurrences of rutile, ilmenite and sphene on the Jos Plateau and elsewhere in the country, is essential to determine the viability of the establishment of a titanium dioxide plant for the paint industry.

The producers of tin, columbite and associated minerals on the Jos Plateau and its environs have over the years made a passionate plea for governmental encouragement through a reduction in the current fees and taxes on royalty.

There is also a need for a re-invigoration of bilateral and multi-lateral co-operation on base-metal and non-metallic minerals such as the memorandum of understanding between Nigeria and the Republic of China on geological exploration and mineral development.

It is suggested that efforts to accord the development of solid minerals the same priority as hydrocarbons should be pursued with relentless determination and vigour.

Key words: base-metal, development, industry, royalty, exploration

3 tables

PASSMA/058

J.S. OJO and G.O. ADEYEMI, 2003
Department of Applied Geophysics, Federal University of Technology, Akure.

Opportunities for ventures in construction materials

In: A.A. Elueze (ed.), Prospects for Investment in Mineral Resources of Southwestern Nigeria, NigerianMining and Geosciences Society (NMGS), pp. 47-54

Summary

Construction materials such as lateritic soils, gravels, sands and rock aggregates are abundant in southwestern Nigeria. Geotechnical studies have shown that the materials could be used as foundation for building, highway pavement and dams construction.

However, lack of interest by State and Local Governments has led to artisanal mining of the natural resources in various communities, without due authorization or compensation. The investment in solid minerals such as sands, gravels, laterites and quarry products will certainly lead to mining of export materials, establishment of local industries, can in turn transform into a more diversified and stable economy, employment opportunities and poverty alleviation.

This paper discusses the investment opportunities attached to construction materials, where they are found in commercial quantities, what they can be used for, cost effectiveness in terms of exploration and exploitation, mining rights and some environmental issues associated with mining so as to ensure that owner communities do not become victims of their endowed resources. This paper also highlights the need for geoscientist to show more interest not only in exploration but to invest and coordinate exploitation of construction materials.

Key words: laterites, aggregates, geotechnical, building, pavement, artisanal, resources, quarry, mining rights, environment

3 figures, 13 references

PASSMA/059

O.A. OKUNLOLA, 1996
Geological Survey of Nigeria, P.M.B. 2007, Kaduna

A synoptic survey of some alternate industrial usages of Nigerian carbonate deposits

College of Engineering Conference Series, Vol. 3, pp. 143 – 160

Summary

Nineteen of Nigeria's Precambrian to Tertiary carbonate deposits are considered in relation to their industrial applications other than cement manufacture. In this study, six alternate usages are considered. They include agricultural, fluxing stone, fillers/extenders, ceramics, sewage waste water treatments and chemical products. The nineteen deposits considered, are namely: Burum, Elebu, Igbetti, Kwakuti, Jakura, Ukpilla, Etobe, Ugbo and Ajaokuta – all Precambrian marbles. Ashaka, Kanawa, Makurdi, Yandev, Abini-Agopi, Igumale, Nkalagum Calabar, represent the Cretaceous deposits, while Ewekoro and Sokoto are the Tertiary deposits.

Physical-chemical characteristics with emphasis on the chemical characteristics were determined. Detailed analysis for CaO, MgO, SiO_2, acid insolubles, Al_2O_3, Na_2O, K_2O, P_2O_3, LOI, $CaCO_3$, $MgCO_3$, Pb, Cd, Cr, were done using a combination of atomic absorption spectrophotometer (AAS), flame photometer, and calorimetric methods. Analytical data on some of the deposits, provided by the works of Bell (1975), Ekwueme (1987), Dada (1990) Ohiume (1991) were also utilised. Some of the usages were considered in relation to lime and whiting derivatives of the deposits. Results are compared with British Standards for each usage.

Agriculturally, most of the deposits could be used as agricultural lime for soil enrichment, except for Kanawa, Elebu and Kawakuti because of their relative high content of acid insoluble – 7%, 15.4%, and 20.7% respectively. Only Calabar (Mfamosing) and Jakura meets the standard for fluxes in steel, with only 37% of the Calabar deposit being useful, suggestive of selective mining. Their high $CaCO_3$ content, low SiO_2, high MgO, low SO_3 qualifies them for consideration chemically. Jakura, Yandev, and Calabar are useful as fillers/extenders in paints, plastics and paper except for the marginally high Al_2O_3 in Yandev and Jakura and the low colour purity of the Yandev deposits. As ceramic whitings, Ukpilla, Jakura, Calabar and Yandev meets the chemical standards. However, only Jakura and Ukpilla are eventually suitable considering other physical standards as colour, smoothness

and lack of grits in final crushings. The lime derivatives of Sokoto, Ewekoro, Makurdi, Yandev, Igumale, Burum and Kwakuti deposits are useful in waste water/sewage treatment, because of their low (traces) acid insolubles content and freedom from heavy metals Cd, Pb, and Cr. For household water treatment, only Ukpilla, Jakura, Calabar, Yandev meet the basic condition for lime content – 50%. The pH values of these deposits put them in the suitability range, but the higher than normal SO_2 content (0.5%) of the Jakura and Yandev reduces their suitability.

The study recommends a much more detailed analysis of the lime and whiting derivatives of these deposits taking into consideration their character variation with depth and lateral change.

Carbonate deposits all over the world have found various usages in industry. The most notable being for cement production, which is the major material in the manufacture of sand-crate block and major building/structural works. Because of this conspicuous usage it has tended to obliterate other important usages of the carbonate rock derivatives, especially the lime and whiting derivatives.

Keywords: chemical characteristics, sewage, pH, whitings, lateral change

8 tables, 2 figures

PASSMA/060

O.A. OKUNLOLA, 1998
Geological Survey Department, Ibadan

Specialty metal potential of Nigeria

Proceedings of the First Mining in Nigeria Conference and Workshop, Ministry of Solid Minerals Development, Federal Republic of Nigeria, NIMAMOP, Global Minerals Limited, pp. 67-70

Summary

The solid minerals sector had contributed immensely to the economic development of Nigeria prior to the advent of petroleum exploitation. Exports of gold, tin, columbite-tantalite, wolframite, lead and zinc earned the country substantial foreign exchange. The group of metals tagged rare or specialty metals which are mostly hosted by granitoids or pegmatoids include columbite, tantalite, tin, lithium (spodamene, lepidolite) and berylium. Some of them have been known to be major foreign exchange earners for Nigeria, prior to the oil boom. In 1995 alone, columbite earned Nigeria 5.17 million in exports.

Key words: pegmatites, rare metals, price

5 tables, 13 figures, 17 references

PASSMA/061

O.A. OKUNLOLA and O. OGENDENGBE, 2003
Department of Geology, University of Ibadan, Ibadan

Investment potential of gemstone occurrences in southwestern Nigeria

In: A.A. Elueze (ed.), Prospects for Investment in Mineral Resources of Southwestern Nigeria, NigerianMining and Geosciences Society (NMGS), pp. 41-45

Summary

Gemstone occurrences in the southwestern part of Nigeria are found within N-S, NE-SW, trending pegmatite veins which are sometimes vertical or steeply dipping.

These veins intrude older lithologies of the migmatite gnesis complex rocks, mafic-ultramafic units and schistose rocks. Prominent locations highlighted, are known to labour tourmaline (blue, green, pink), spessartine (yellow) and a almandine (red) garnet, beryl (aquamarine), topaz and rose quartz. They occur as discrete crystals embedded as anhedral to euhedral shaped crystals within the pegmatites especially the weathered kaolinised zones. The relatively low cost of recovery and the appreciable profit margin between production costs and market values enhance this mineral type as a veritable foreign exchange earner. The present haphazard manner of exploitation leaves much room for wastage and does not encourage long term mine planning.

Key words: gemstones, pegmatites, recovery, wastage

1 figure, 3 tables, 8 references

PASSMA/062

O.A. OKUNLOLA, O. OGENDEGBE and A. OJUTALAYO, 2003
Department of Geology, University of Ibadan, Ibadan Nigeria

Compositional features and industrial appraisal of the Baba Ode talc occurrence, southwestern Nigeria

Global Journal of Geological Sciences, Vol. 1, No. 1, pp. 63 – 72

Summary

The Baba Ode talc with a preliminary quantitative estimation of 3 million tons, occurs in close association with a mafic complex. This complex is surrounded by a series of compositionally variable gneisses, syenites, phillites and mica schists, granites and coarse pegmatites, all of the Iseyin-Oyan schist belt.

This study aims at assessing the petrographic, chemical and physical characteristics of the talc body, in order to appraise its industrial suitability.

Two petrographic varieties, a white talcose, and a fibrous light grayish tremolite variety characterize the body. X-ray and petrographics studies how that they composed mainly of talc, tremolite and chlorite, with subordinate quartz and muscovite. Chemical analysis of representative samples using atomic absorption spectrometer (AAS) instrumentation methods, shows that the tremolic variety is higher in Si_2O (53.97%) and Al_2O_3. (1.9%) than the talcose. Fe (t) as Fe_2O_3 (4.35%) and CaO (1.7%) contents in the two varieties, are non-variable. While MgO values in the talcose (33.25%) is higher than in the tremolitic type (31.39%). Concentrations of TiO_2, MnO_2, NaO and P_2O_5 for both varieties do not exceed 0.25%.

Firing characteristics reveal an average loss on ignition (L.O.I) of 4.21% for the two types. Linear shrinkage (L.S.V.) average 1.35%, while average water absorption capacity is 4.1%. A flat to gently undulating topographic configuration and easy accessibility enhance the mineability of the body. The talc body therefore with some beneficiation will be useful in paper, paint, roofing and ceramic manufacturing.

Key words: talc occurrence, petrographic, chemical, industrial

8 tables, 3 figures

PASSMA/063

P. O'NEILL, 1982
ITIS, Rugby, England

Small scale mining boom starting: the role of ITIS

AGID NEWS, No. 30, pp. 26-8

Summary

A number of small-scale mining projects, combining technical expertise and commercial backing in Kenya and other countries, are a significant pointer to new explorations of vital mineral resources. They offer a source of employment in rural areas during the off-season, a saving on foreign exchange by import substitution and a promising alternative to that old problem of foreign companies mining a product for export which the host country has to buy back at a later stage at a higher price.

Key words technical expertise, employment, import substitution

1 figure

PASSMA/064

L. ONYEKWELU, 1982
Geo-Pen Consultants, P.O. Box 2040, Enugu, Nigeria

Industrial minerals of \Nigeria

AGID NEWS, No. 30, pp. 33-37

Summary

This paper deals mainly with those group of industrial minerals which are often overlooked by the national planning and mining agencies. Since industrialization is the key note behind this paper, and the solution to most of the economic problems of the developing countries, new deposits and mines of highly important commercial minerals must be found, investigated, developed and brought into steady exploitation at least to meet the needs of an ever increasing population, and above all to reduce the pressure of labour migration to the urban centres in search of employment opportunities.

Key words: industrial minerals, developing, countries, employment

3 figures

PASSMA/065

O. OSHIN, 2003
Department of Geology, University of Ibadan, Ibadan

Technical and economic strategies in mineral resources development and exploitation

In: A.A. Elueze (ed.), Prospects for Investment in Mineral Resources of Southwestern Nigeria, NigerianMining and Geosciences Society (NMGS), pp. 93-105

Summary

The thre principal stage in mineral development are as follows; the investigation stage during which the mineral of interest is searched for (prospection and exploration) and evaluated to determine its worth; the production state (mining) involving the extraction of the useful part of the discovered mienral deposit from the ground and the processing stage during which the mined mineral material is converted into marketable products.

There are many components to a mineral investment, with the capital outlay increasing as the stages of the mineral project progresses. In order to minimize investment risks, every major phase of the project must be thoroughly evaluated and no further funds are committed, unless the project indicates commercial viability. Decision to proceed from one stage to another, is based on a body of technical and economic data. In the preliminary stage of exploration this body may be incomplete but the final decision to commit funds to build a mine is based on discounted cash flow (DCF) analysis derived from detailed technical, economic and feasibility studies of the mineral deposit of interest.

Sensitivity and risk analyses are usually used to estimate the uncertianty in the expected value of decision making criteria.

Key words: mineral, resources, investigation, production, processing, sensitivity risk

2 tables, 4 figures, 8 references

PASSMA/066

O. OSIBANJO, 2003
Federal Ministry of Environment – University of Ibadan Linkage Centre for Cleaner Technology and Hazardous Waste Managemen. Department of Chemistry, University of Ibadan, Ibadan

Environmental aspects of solid minerals mining

In: A.A. Elueze (ed.), Prospects for Investment in Mineral Resources of Southwestern Nigeria, NigerianMining and Geosciences Society (NMGS), pp. 123-130

Summary

Mining is an integrated, multiphasal activity which includes geological reconnaissance, prospecting, exploration, extraction, processing and mine closure. Mining activities provide employment opportunities, infrastructures and raw materials for local industries and for exports. However the industry is characterised by high visible environmental problems, including noise and vibration, water and air pollution, destruction of terrestrial and wildlife habitat, encroachment on archaeological and historical resources as well as cultural and recreational sites. Others include occupational and public health problems, sociological and cultural conflicts.

In realization of the danger of mining activities to biodiversity and sustainable environment, the Federal Government of Nigeria (FGN), through its agencies, notably the Federal Environmental Protection Agency (FEPA) and the Federal Ministry of Environment (FME) promulgate Decree 86 of 1992 which made environmental impact assessment (EIA) mandatory for all new development projects, and recommended environmental audit for existing projects including mining. Also in 1995, FEPA/FME produced EIA sectoral guidelines for mining of solid minerals, beneficiation and metallurgical processes.

The fundamental principles for the mining sector which was produced by the international business circle in 1991 and which was revised in 1999, should be enforced in Nigeria, especially now that he national focus has shifted to solid minerals.

Key words: solid minerals, environmental problems, sociology.

6 tables

PASSMA/067

A.B. RAO and J.G.C. BARROS, 1982
Depto.de Geociencias, Universidade de Brasilia, 70910 Brasilia, Brazil

Perspectives of small scale mining in developing countries: Brazilian example

Summary

Small scale mining (SSM) is characterised and examples are cited. Two cases are detailed and their geological conditioning is also given. Regarding the future of SSM, some ideas are presented, based on Brizilian experiences. SSM is considered necessary to avoid social problems, and its recognition by the governments is recommended.

Key words: small scale mining, social problems, Brazil

12 figures, 4 references

PASSMA/068

J.L. RAU and P. NUTALAYA, 1982
Department of Geological Sciences, University of British Columbia, Vancouver, B.C., Canada

Small scale mining in Thailand: salt, gold and gems

AGID NEWS, No. 30, pp. 9-14

Summary

Three case studies of small scale mining of salt, gold and gems are included with adequate illustrations. Related environmental and social problems from salt and gold mining, are focussed. Thailand is a gem producing country.

Key words: salt, gold, gems, mining, Thailand

7 figures

PASSMA/069

P. de SAINT SIMON, 1999
Global Minerals Limited, Abuja

Speciality metals in Nigeria, potential for a world class deposit

Second Mining in Nigeria Conference, Ministry of Solid Minerals Development, Federal Republic of Nigeria, NIMAMOP, Global Minerals Limited, Abuja.

Summary

The recent discovery of the tantalite bearing pegmatite in Nigeria comes at the time when two major producers are running out of resources, namely Lake Bernic (TANCO) and Sao Joao Del Rei (Metallurg). At the same time, pressure is mounting over the supply of tantalum to produce all the high-tech apparatus such as cell phones and television sets.

The potential for the full discovery of a world class tantalum deposit within the Nigerian pegmatite field, is very high and will be pursued as part of the NIMAMOP endeavour. Already, sufficient is present to warrant the detailed exploration of the Udegi area of private companies. With such a probable source of high value raw materials, Nigeria should now investigate the possibility of processing it locally and perhaps create a whole new industry, a possible replacement to the formerly thriving tin industry.

Key words: tantalum, pegmatite, high-tech apparatus, recent discoveries.

4 tables, 2 figures

PASSMA/070

G.M. SHEKH, 1998
Nigeria Kaolin Limited, Jos

Kaolin mining project opportunity at Major Porter

Proceedings of the First Mining in Nigeria Conference and Workshop, Ministry of Solid Minerals Development, Federal Republic of Nigeria, NIMAMOP, Global Minerals Limited, pp. 91-106

Summary

Kaolin is a white, soft clayey material composed principally of the mineral kaolinite

Due to its unique properties, kaolin is used in very many industries. The occurrence of kaolin is reported in many States of the Federation, with indicated reserves of over 80 million tonnes.

Currently, the Major Porter kaolin is the only deposit that has been studied in greater detail, including marketing, geological, mining and processing aspects. The deposit has about 1 million tonnes of proven reserves and 2 million tonnes of indicated reserves. The existing operation produces kaolin for the paints, ceramics, rubber, plastics, soap, detergent and chalk industries.

This paper presents an overview of the present mining activities at Major Porter, the recent studies carried out and the potentials of the Major Porter deposit for new investment and for the production of a wide range of products. A brief mention of the kaolin deposit at Darazo is also made.

Kaolin has numerous industrial uses due to its unique properties. The demand for kaolin in Nigeria, is in excess supply. Recent work has shown that the Major Porter kaolin can be processed to produce specialty grade product for export. The Major Porter deposit contains high grade kaolin that can be processed to meet with the specifications of most of the user industries. Because of the low cost of labour and availability of utilities, a satisfactory profitability could be achieved by developing a new plant for export purposes. The deposit is shallow with low overburden which makes extraction relatively cheap. The kaolin deposit in the Darazo area has indicated reserves of 10 million tonnes. The Darazo deposit can be easily processed to produce kaolin chipping for the fertilizer industry and "air floated" kaolin powder.

Key words: kaolin, properties, rubber, reserves, Darazo

6 tables, 9 references

PASSMA/071

P.L. SHRESTHA, 1982
Mineral Exploration Development Board, Kathmandu, Nepal

Near-economic and sub-economic deposits in Nepal

AGID NEWS, No. 30, pp. 39-41

Summary

Nepal Kingdom located in the Himalayas, has mining problems typical of hilly regions. Concepts on mineral resources are followed by characterization of near – and sub-economic deposits. Small scale mining could always be an option, but with all its peculiarities.

Key words: Himalayas, mineral resources, mining problems

1 table

PASSMA/072

W.G. STEFAN, 1991
P. O. Box 46, 6710 Calboyóg City, Philippines

The legal battle for small-scale mining in the Philippines

AGID NEWS, No. 66, pp. 13-15

Summary

Small-scale miners are harassed all over the world. Mining codes and other government policies almost invariably favour big mining interest, seem after many years of lip service paid to small mines as important sources of rural employment and growing contributions to national income. In the Philippines, the battle for small miners'

right is yet undecided. While lawmakers are still siting on one of the most progressive "People's Mining Law", the issues are settled out in the hills- at gunpoint.

Key words: mining codes; national income, government policies.

2 tables, 3 Figures

PASSMA/073

H. STIGZELIUS, 1982
ESCAP, Jalan Jenderal Sudirman 623,Bandung, Indonesia

Notes on cases of small scale mining

AGID NEWS, No. 30, p.2

Summary

Seven cases considered as of small scale mining, are reported.

Key words: small scale mines, exploration, inventory

PASSMA/074

O.A. UCHE, 1998
Company Secretary/Legal Adviser, Global Minerals Limited,Abuja

Proposed amendments to the Nigerian mining code

Proceedings of the First Mining in Nigeria Conference and Workshop, Ministry of Solid Minerals Development, Federal Republic of Nigeria,-NIMAMOP, Global Minerals Limited, p. 151.

Summary

Amending Nigeria's mining legislation will enable the country to compete effectively for international mining investment funds. The Centre for Energy, Petroleum and Mineral Law and Policy, University of Dundee has confirmed that over 75 countries have amended their mining legislation over the past few years. Why? the reason can be found in a report by the Mining Journal of Journal 1998 (page 1) which states the over USD 600 million was spent in exploration activities in Africa on account of newly liberalised mining codes in many African countries. It is pertinent to point out that most of this money was spent in West Africa. Nigeria did not receive one dollar of this investment.

By the time the country's Solid Minerals Policy and the Minerals Law are made public, investors in the solid minerals sector will find that Nigeria has environmental regulations which should make mining reasonably environmental friendly. Pressure from local communities with these environmental NGOs within and outside the country will make them want to comply with these regulations. A system of incentives such as been suggested will facilitate compliance. But in the final analysis the responsibility to enforce compliance will be those of FEPA and the Inspectorate Division of the Department of Mines, a responsibility which they can discharge effectively, if they are well-staffed, well-equipped and appropriately motivated.

Key words: amendment, legislation, environmental, regulations, compliance

PASSMA/075

E.N. UGWU, 2003
Fifan Limited, 101 Zik Avenue, P. O. Box 3330, Enugu

Evolution and prospects of the coal industry in Nigeria

In: A.A. Elueze (ed.), Contributions of Geosciences and Mining to National Development, Nigeria Mining and Geoscience Society (NMGS), pp. 51-61

Summary

Nigerian is endowed with abundant economic mineral resources, some of which are energy resources such as petroleum, gas and coal. The thrust of this paper is on coal, which sparked off industrial revolution in Europe in the 13th century. Since then, coal has been known as the "backbone" of industrialised nations, as they still rely heavily on it now and in the foreseeable future. Those nations use coal for heating, power generaiton, steel production, cement manufacture and the production of its numerous chemical raw materials as contained in petroleum. In a nutshell, coal is the only alternative mineral to petroleum, and in the above circumstances, Nigeria should not be an exception.

In Nigeria, coal deposits cut across about 16 states of the Federation with proven reserves of 2 billion tons and several virgin areas still unexplored. Actual mining started in 1951 and various methods have been used, since then. The peak production was in 1958/59 with 8300 men. Coal has good potential and much depends on adequate funding, power supply and well enunciated coherent energy policy.

Key words: coal potential, funding, energy policy, power supply

1 table

PASSMA/076

L. WEISSBERG, 1996
Instituto de Geosciencias,Universidade de Sao Paulo, Rua do Lago 562, CEP 05508, Sao Paulo, Brazil

Mining and sustainable development

Geoscience and Development, No. 3, p. 26.

Summary

The AGID-supported project on *Mining and Sustainable Development*, has as its primary aim the consultation of AGID members around the world through a questionnaire. This is to establish a consensus related to them and to find out what work is being carried out where it is taking place and by whom. Over the first six-months period, a lot of information was received and an initial report has been circulated to respondents. A final report is now being prepared for distribution to AGID members.

Responses are being analysed and it is intended to put together the opinions and viewpoints expressed so as to offer a global state-of-the-art in this field. It is also proposed to set up an international electronic library to be consulted by internet from around the world. This will require major support from AGID members who can contribute to this bank of information and publications. Now, when the world can be linked by computer, we who work in this field, can be a large international family.

Modern mining is practiced by two major types of company around the world, whether in developed or developing countries large-scale and small-scale. Large mining companies are sophisticated organizations often located closer to large urban centres. Environmental regulations are usually effectively enforced, and these companies are now looking at the possibilities of water recycling. Such companies tend to be in the developed countries, where environmental laws are in place and where penalties are strict.

In developing countries, although large-scale mining takes place, environmental protection measures are deficient because the law is weak and the priorities are different – the laws exists but there is no will to enforce them. There is also a lack of political will to promote environmental protection laws. This needs to be changed, and professionals working on the environmental aspects of economic and social development are pioneers in presenting a balanced posture for future generations.

Key words: AGID, questionnaire, pioneers, professional, gravity action.

PASSMA/077

T. WELS, 1982
Oldlands Leys, Uckfield, Sussex, England

Large and small mines

AGID NEWS, No. 30, pp. 31-32

Summary

Small scale mining through some facilities that could be offered by large mines, would result in mutual benefit. Possible assistance of AGID, ITIS and government departments will accelerate this relationship.

Key words: mining, facilities, benefit

1 figure

PASSMA/078

M. WOAKES, 1981
Department of Geology, Ahmadu Bello University, Zaria, Nigeria

A metallogenetic appraoch in mineral exploration in Nigeria

Journal of Mining and Geology, Vol. 18, No. 1, pp. 216-217.

Summary

Metallogeny when applied to mineral exploration, can give significant cost economies by effectively delimiting favourable targets. From world-wide examples, the application of metallogenetic concepts may be found effective in the search for economic minerals in Nigeria.

Key words: metallogeny, mineral exploration, concepts

14 references

PASSMA/079

J.A. WOLFE, 1982
TAISAN COPPER, INC, CCPO Box 1868, Makary, Metro Manila, Philippines

Problems in formulating mineral policy

AGID NEWS, No. 30, pp. 42-48

Summary

In formulating national mineral policies, if governments desire to have foreign banks or corporations invest funds and provide technology, they must recognize that this is possible only if the "rent" is paid on both the

money (interest) and technology (profit). An atmosphere conducive to investment, includes a history of honouring contracts and not changing the rules after the investment has been made. Nationalization or expropriation must be regarded as breach of contract. If a national policy requires majority ownership by nationals, and if they are unable to contribute their proportional share, a foreign investor needs to find a "bonanza" to justify investment. He has, however, many geographic alternatives open to him and will use the DCF method for testing the opportunities.

On the other hand, the nation must be meticulous in evaluating risks of internal investments, because some banking and financing houses do not study proposals as thoroughly as they should, if the host government will guarantee the loans. Moreover, organizations may even support unsound projects in developing countries to sell equipment or to protect industries in their home country.

Aborted, marginal and deficit-ridden projects can have a very serious cumulative effect on a nation's economy. It cannot be over-emphasized that purchase of the best possible, unbiased, technical advice, is the best insurance for successful undertakings.

Key words: mineral policies, banks, risks, economy

1 figure, 4 references

PASSMA/080

J.B. WRIGHT, D.A. HASTINGS, W.B. JONES and H.R. WILLIAMS, 1985
Department of Earth Sciences, The Open University, Walton Hall, Milton Keynes, MK7 6AA, UK

Geology and mineral resources of West Africa

George Allen & Unwin (Publishers) Ltd., London, 187p.

Appendix 1

Federal Ministry of Solid Minerals Development
Study on Women and Child Labour in Mining in Africa

Questionnaire for workers, investors and mining community dwellers

1. Location .....
2. GPS Coordinates .....
3. Name of town/settlement .....
4. Name of LG Area .....
5. Country .....
6. State .....
7. Geopolitical Zone .....
8. Nationality of respondent .....
9. Nationality Mix of the community ..... e.g. No. of Nigerians, foreigners and their ..... nationalities .....
10. Age of respondents:
    - < 20 years .....
    - 21 – 40 years .....
    - 41–60 years .....
    - ≥ 61 years .....
11. Sex of Respondent: Male ..... Female.....
12. Marital Status: .....
    - i. Single .....
    - ii. Married .....
    - iii. Divorced .....
    - iv. Widowed .....
    - v. Others .....
13. Educational Status of Respondent:
    - i. None .....
    - ii. Koranic education
    - iii. Primary school .....
    - iv. Secondary school
    - v. Tertiary institution .....
14. What is your primary occupation? .....
    - i. Farming .....
    - ii. Mining .....
    - iii. Trading .....
    - iv. Teaching .....
    - v. Civil Service .....
    - vi. Artisans (specify) .....
    - vii. Students .....
    - viii. Others (specify) .....
15. What is your secondary occupation?, if any:
    - i. Farming .....
    - ii. Mining .....
    - iii. Trading .....
    - iv. Teaching .....
    - v. Civil Service .....
    - vi. Artisans (specify) .....
    - vii. Students .....
    - viii. Others (specify) .....
16. Status of Respondent (Tick as many as applicable): .....
    - i. Investor .....
    - ii. Land owner .....
    - iii. Community leader .....
    - iv. Government Officer .....
17. If an investor, what are your sources of finance?
    - i. Bank loan .....
    - ii. Cooperative loan .....
    - iii. Personal savings .....
    - iv. Financial assistance from abroad (specify) .....
    - v. Others .....

18. What is your estimated income in a month:
    i. <N10,000.00
    ii. N11,000.00–N20,000.00
    iii. N21,000.00–N30,000.00
    iv. N31,000.00–N40,000.0
    v. N41,000.00–N50,00.00
    vi. ≥N51,000.00

19. List the major festivals/occult practices associated with mineral exploitation in this settlement:
    i.
    ii.
    iii.
    iv.

20. Is there any mineral available in this community/settlement? YES or NO

21. If yes, name the minreal

22. Where is the mineral located in the community/settlement

23. How is the mineral mined?
    i. Open pit mining method
    ii. Underground mining method
    iii. Others

24. List some of the equipment used in the mining activity in this community:
    i.
    ii.
    iii.

25. Are there accidents/injuries associated with the activities?, specify type, frequency/ number:
    i.
    ii.
    iii.

26. What is the mineral in (20) used for locally?
    i. Traditional festival
    ii. Local crafts (specify)
    iii. Decoration purposes (specify)
    iv. Construction purposes
    v. Ornamentation purposes
    vi. Income generation
    vii. Others

27. What do you think the mineral is used for at the national and international levels?
    i.
    ii.
    iii.
    iv.
    v.

28. Are you aware of the need to have a licence for the exploration/exploitation of the mineral available in this community?
    i. Yes
    ii. No

29. If yes, which of the following do you/they have?
    i. Prospecting licence
    ii. Mining licence
    iii. Both
    iv. Others

30. Please provide relevant information on the following:

S/N	Activity	Categories of people involved				No. of hours spent/day			Average income derived/day		
		Men	Women	Boys	Girls	<3	4-6	≤7	≤N1000	N1001-N2000	≥N2001
1.	Prospecting										
2.	Mining										
3.	Processing										
4.	Marketing										

31. Rank the following benefits derived as a result of the availability of the mineral in this community:

S/N	Benefits	V. Important	Important	Less Important	Not Applicable
1.	Roads				
2.	Electricity				
3.	Pipe-borne water				
4.	Boreholes				
5.	Hand-dug wells				
6.	Health Centres				
7.	Maternity Centres				
8.	Provision of Doctors/Nurses				
9.	Provision of Schools				
10.	Provision of Library				
11.	Provision of Technical Skills				

32. Is there any disease/ailment associated with the exploitation of mineral in this community?
.....

33. If yes, specify .....
.....
.....
.....

34. Rank the following likely social and health impacts of the exploitation of the mineral(s) in this community:

S/N	Impact	V. Severe	Severe	Less Severe	No Impact
1.	Immigration				
2.	Emigration				
3.	Family instability				
4.	Neglect of household responsibilities				
5.	Increase in child labour				
6.	Increase in school drop-outs				
7.	Prevalence of drug abuse				
8.	Increase in crime rate				
9.	Change in occupation				
10.	Shortage of farm labour				
11.	Increase in sexual trade				
12.	Prevalence of sexually transmitted diseases (STD)				
13.	Prevalence of early marriage/ unwanted pregnancies				
14.	Increase in water-borne diseases				

35. Rank the following likely environmental impacts of the exploitation of the mineral(s) in this community:

S/N	Impact	V. Severe	Severe	Less Severe	No Impact
1.	Destruction of shrines/ traditional place of worship				
2.	Land despoilation				
3.	Vegetation degradation				
4.	Soil contamination				
5.	Water pollution				
6.	Air pollution				
7.	Noise pollution				
8.	Destruction of farmland				
9.	Collapse of mine pit				

36. Suggest ways of improving mineral exploitation, and reducing/minimizing the negative impacts of the exploitation of mineral(s) in this community:

i. .....

ii. .....

iii. .....

37. Any other relevant remarks:

i. .....

ii. .....

iii. .....

Project Team

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