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MINING DEVELOPMENT PROJECTS AND THE ENVIRONMENT THE AFRICAN EXPERIENCE

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ABSTRACT

Industrial activities depend on natural resources; one of which happens to be the mining industry. This industry continues to play a major role in the economic sector of most developing countries, particularly, Africa. Today other than the agricultural sector, large and small-scale mining still play a significant role in the overall socio-economic and physical infrastructure development of these countries.

The activities of National and Trans-national Corporations (TNCs) in the mining sector have made major impacts on the economies and employment generation of most African countries, through technology transfer and mining ventures. However, environmental damages have thus far been generally overlooked. This need is receiving a tremendous amount of attention in light of attempts to include environmental considerations into every aspect of the socio- economic development plans and policies of African developing countries.

In view of the fact that TNCs will continue to play key roles in the development of mining ventures in developing countries, African countries are applying sufficient attention to the environmental aspects of mining activities undertaken by TNCs, by developing. Environmental Policies and Guidelines and by conducting Environmental Impact Assessment (EIAs) studies prior to the exploration and development of these resources .

The African Development Bank as a development partner, finances mining projects in its Regional Member Countries (RMCs). Against this background, it has developed Mining and Industrial Policy Guidelines which are utilized by task managers of the Bank and experts of RMCs when appraising projects. It also has developed other relevant guidelines as Integrated Environmental and Social Impact Assessment Guidelines. These guidelines provide relevant reference materials to the staff of the Bank and RMCs on how to adequately consider cross- cutting themes while assessing the environmental and social impact of a project.

Because project-specific environmental impact assessments are not adequate instruments for addressing impacts at the policy, plan and program (PPP) levels, and are unable to address cumulative impacts, the Bank has been committed to introducing Strategic Impact Assessment (SIA) Guidelines to be used as a systematic process in addressing the environmental consequences of proposed policy, program or plan initiative of multinational projects including mining, so as to ensure that they are fully included and appropriately addressed at the earliest stage of decision-making on par with social and economic considerations

Environmental and Social Assessment Procedures (ESAP) have also been developed by the Bank so as to reflect the more integrated environmental and social approaches in addressing cross-cutting themes. The guiding principle of the ESAP is to ensure that the Bank's policy, program and plan have been designed so as to make them environmentally and socially sustainable, involving stakeholder participation and timely disclosure.

INTRODUCTION

As part of the overall strategy of the Bank to incorporate environmental concerns into its lending programs and to improve and strengthen the operations and management of all of the sectors in which it intervenes, the Bank prepared and approved its first environmental Policy in 1990. That policy has been recently updated to include other crosscutting issues such as poverty, gender participatory involvement, NGOs/Civil Society and health issues. In 1991 the Bank initiated the preparation of the Environmental Assessment Guidelines which were approved by the Board of Director in 1992. These guidelines have however been replaced by the Environment and Social Assessment Procedures (ESAP) for the Public and Private Sector Operations of the Bank. Several sector guidelines have been prepared by the Bank including the Mining Guidelines, prepared in 1995. These guidelines are incorporated into the environmental evaluation process at every stage of the project cycle. Methods to assess expected environmental impacts usually are combined with administrative procedures so that results of the environmental assessment would become an integral part of project planning and decision-making. The guidelines are used as basic references for Bank staff and officials and experts of Regional Member Countries (RMCs) to assess environmental impacts of lending programs and projects.

SMALL-SCALE (ARTISANAL) AND MAJOR MINES OF AFRICA

The African mining industry has been in existence since the late nineteenth century. Industry was inspired by the discovery of pertinent ore-bearing geologic structures (e.g. the Cooper Belt of Zambia, the Great Dyke of Zimbabwe, the Mt. Nimba Iron Ore Mine of Liberia, Gold Belts of Ghana, etc.). Its evolution can be divided into three periods; the pre-colonial, the colonial and the post-colonial (Kogbe, C.A., 1988).

The pre-colonial period consisted of small-scale mineral exploitation by indigenous Africans. Their mining activities were marked by extensive metal working of cooper and iron in many places on the continent**.**

The colonial period witnessed the intensification of mineral exploration and exploitation (large-scale mining) by Transnational Corporations (TNCs). This period also witnessed the setting up of various geological-related institutions and survey departments. These were responsible for geological mapping, exploration and prospecting as well as the control of mining activities**.**

Presently, (post independence period) the continent produces a range of mineral raw materials necessary for modern industries (fig. 1). The mineral production represents a high percentage of the world production for certain minerals which are of great importance to modern industries: cobalt (60%), diamonds (24%), uranium (38%), phosphates (24%), bauxite (15%), copper (22%), manganese (20%) and manganese
(20%) (Kogbe, C.A., 1988). Unfortunately, these minerals and metals only account for 5% of total African exportations, although in certain countries, they are of great importance.

The socio-economic benefits from mining ventures in Africa have also been tremendous in many instances. The industry has provided a means of livelihood for workers and their dependents, such as schools, hospitals, housing and other major developmental activities through royalties received from

concessions. More than any other sector of the African economy, the mining industry has provided the locomotive power for national development and growth (Shannon, 1992).

The Archaean rocks in West, Central and Southern Africa, represent some of the richest mineral provinces in the world. This geologic situation (see figure I) attracted major investments by transnational and national mining companies that accounted for over 70 % of the export earnings of some states. Mining dominated the economy of many of these states for a long time until the late seventies to eighties when activities declined due to raw material stockpiling in the industrialized countries, recycling of scrap and waste material, and the replacement of metal based parts by plastics.

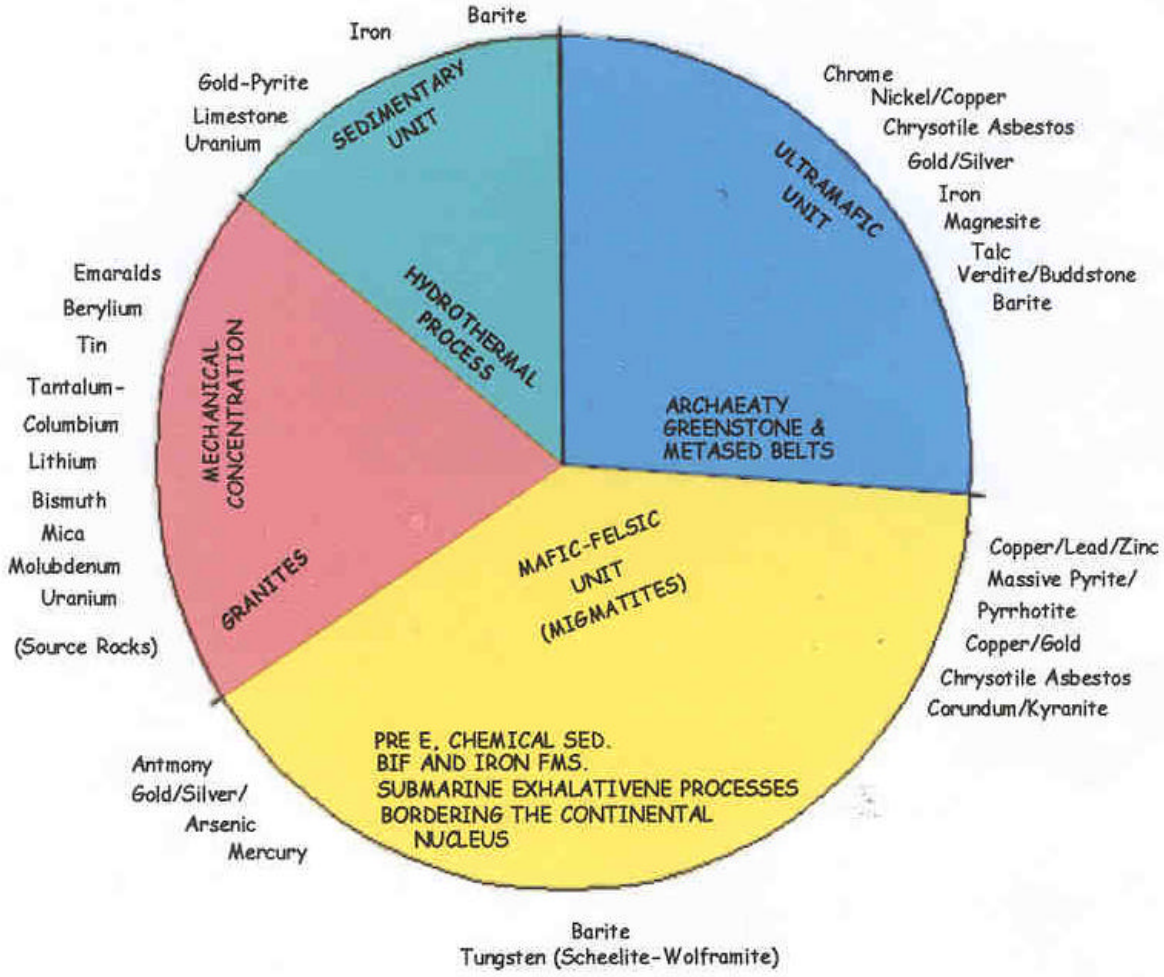

Fig.1. Pie chart showing the relationship of Archaean mineralization in Africa South of the Sahara to the four main lithologic components of ancient granite-greenstone terranes (After Anhaeusser, 1986).

ENVIRONMENTAL CONCERNS ASSOCIATED WITH MINING

Despite the contributions made by the mining sector, it has also contributed to extensive damage of the land being exploited such as abandoned mines, gullies, borrow pits, de-vegetation and silt runoff to surface drainages. In some instances, crops and economically important trees have been destroyed indiscriminately. Tailing from mine sites have been deposited directly into important rivers and adjacent creeks resulting into brick-red coloration. The effects of sulfur dioxide (SO2) and arsenic trioxide (As203) on vegetation and water bodies have been severe. On the other hand, open pit operations have caused extreme sedimentation in creek beds and highly suspended sediment concentrations in downstream drainages. In some instances, crops and economically important trees have been destroyed indiscriminately. Tailing from mine sites have been deposited directly into important rivers and adjacent creeks resulting into brick-red coloration. The effects of sulfur dioxide (SiO2) and arsenic trioxide (AsO3) on vegetation and water bodies have been severe. On the other hand, open pit operations have caused extreme sedimentation in creek beds and highly suspended sediment concentrations in downstream drainages rendering the water of several villages and towns unfit for drinking and other domestic uses. River dredging for gold for gold and diamond as is practiced has endeared most rivers very turbid and unfit as a source of drinking water, recreation and other uses.

In instances where gold recovery aboard the dredges is by mercury to amalgamation, the dredges have been reported to lose a large amount of mercury adjacent rivers. Oil and grease are also lost to the rivers in the process. For instance, in the Dunkwa Goldfields of Ghana, it was reported in November of 1990 that the dredges were reportedly losing about 40 kilograms of mercury per month. In the Republic of Sierra Leone, where the mining of bauxite, rutile, diamonds and gold by national and TNCs have caused severe damages to the land, large pits and trenches have been left un-reclaimed and un-vegetated as a result of large and small-scale mining (NSR,1991. Conditions are expected to worsen as African developing countries attempt to increase their development efforts through mining and manufacturing activities.

MITIGATION MEASURES AND BEST PRACTICES FOR BUILDING SUSTAINABLE LIVELIHOODS OF COMMUNITIES

Attempts to control negative environmental aspects in mining are now becoming a priority in most African countries in light of the global demands for environmental quality control and the need to include mitigation measures into the design of all projects with negative impacts. African countries having a history of mining e.g., Ghana, South Africa, Liberia and Sierra Leone are now paying the price for land reclamation and other environmental problems caused by adverse mining activities. For new mining ventures however, the cumulative experience can be used to predict future impacts, alternative development strategies and control and mitigation methods. These experiences can be scrutinized in terms of their suitability and effectiveness in minimizing perceived impacts (UNCTC, 1985).

Mining companies must be consistent with the socio-economic objective of the countries. They must conduct their operations in such a manner so as to prevent or where prevention is not reasonably

practicable, mitigate consequences adverse to the environment and/or to the health of people affected by such operations.

In determining what actions shall be taken or omitted by companies, due regard should be paid to the requirement of good mining and industrial practice along with the existing state of techniques for preventing or mitigating the adverse consequences. In the absence of good mining and industrial practice, the State authorities should enforce compliance with environmental provisions and standards in every case of infringement. For economic, social and environmental mishaps, the companies must put in place several schemes for meeting the costs of these adverse effects such as performance bonds, insurance policies and bank guarantees.

Preventive measures to safeguard the environment from excessive air pollution such as dust; methane gas, carbon monoxide, nitrogen oxides and carbon dioxide during production operations must be included in the design of every mining project prior to operations. Preventive measures for dust emissions must include but not be limited to properly designed procuring machines, water wetting, proper ventilation and as a last resort to protect workers, approved resort masks must be worn. The degree of exposure and the effectiveness of control measures should be monitored by taking air samples regularly for analyses and by conducting regular medical examination of mine workers in order to assess the ill effects of dust exposure (Shannon, 1993 a and b, 1994).

Soil and rock waste, tailing and mine water result from the extraction and beneficiation of metallic ores, uranium overburden, asbestos, phosphate rock and oil shale. Approximately, 50 percent of the mine waste is generated during the process pf gaining access to the ore mineral body. Management of wastes utilizing the mining guidelines, impact assessment study and management plan can avert the waste problems by treating or containing the waste so that it does not enter transport pathways.

Mining and processing of metallic ores have resulted in the degradation of surface water and ground water supplies. One of the major causes of this contamination is acid generation from the oxidation of sulfur and iron bearing minerals. The sulfur mineral reacts with water and oxygen in the presence of bacteria to produce sulfuric acid and iron hydroxide or sulfate. Low pH values (high acidity) result in the dissolution of minerals and release of toxic metals and other constituents into streams, rivers and lakes (Beijer Institute, 1987).

Preventive measures in mining should also be prescribed through mining laws and regulations. These regulations and laws must be checked and ascertained by constant monitoring. It is important that mine workers are trained and educated in prevention measures. Mining legislation is important that mine workers are training and educated in prevention measures. Mining legislation is important because it sets rules of behavior on mine authorities with regards to health and safety as well as give government the authority of legal control and inspection. Many countries today have a mining act, or regulations on occupational safety, environmental hygiene, hazardous substances, public health, sanitation and others. Because of the complex nature of mining, many different legislations and acts have to be dealt with along with different ministries and institutions. It is therefore, very important that there exist some form of coordination between these bodies.

TOOLS FOR GUARANTEEING GOOD AND SUCCESSFUL MINING PROJECTS

Environmental Impact Assessment (EIA) studies for mining developing projects in Africa are important. These studies encompass detailed field and laboratory investigations, which entail the quantification of the effects of the project on the physical and human environment. They also entail the provision of mitigating measures and monitoring plans. The studies are a priority for Africa for the following reasons :

Environmental degradation (water pollution, air pollution, soil erosion, sedimentation, improper solid and liquid wastes disposal, loss of vegetation, burrow pits, etc..) which occur as a result of important mining practices, indicate that it is necessary at the very start of the project cycle that environmental factors be considered and incorporated into the design of the project ;

To assist policy makers determine environmental protection needs. Early studies coupled with detailed investigations should be able to give the kind of relevant information for mitigating possible negative impacts associated with a mining project; and

EIA studies provide sufficient information for the issuance of a mining license to the interested company by appropriate government agency.

ENVIRONMENTAL AND SOCIAL ASSESSMENT PROCEDURES (ESAP)

ESAP reflect the more integrated environmental and social approach addressing all cross-cutting themes; ensure that the Bank's projects, programs and plans have been designed to make them environmentally and socially sustainable, involving stakeholder participation and timely public disclosure; and provides a co-ordination mechanism between the Bank and the relevant Government Agencies. It also plays an important role in building the environmental and social management capacity of the Project Executing Agency.

Capacity Building And Training

Extensive training and capacity building must be undertaken for all miners, particularly artisanal miners whose skill are underdeveloped. This training is necessary so as to develop the skills necessary for efficient operation of mines and to comprehend fully the manpower policies of the government with regards mining. This will also improve their knowledge in recognizing adverse effects associated with mining and will help them develop the necessary skills in alleviating them.

Appropriate legislation

African countries must devise appropriate legislation to protect the degradation of their environment resulting from mining activities. This will demand that a fair share of their financial resources be set aside for the formulation of mining environment laws and personnel training. Environmental values and regulations must be a part of the African corporate culture so that managers and employees will accept environmental responsibility as part of their everyday performance.

The general approach must be to encourage and foster a healthy mining industry with due regard to the environment. However, establishing guidelines, legislations, policies or standards without implementing them is a waste of time. Trained staff and skilled workers must be developed to

monitor and enforce standards and regulations. The countries must be prepared to pay better salaries to prevent by-passing of legislation and regulations by companies

Environmental and Social Management Plan

Another important pre-investment mining requirement is the need for an Environmental Management Plan. This plan consists of a set of measures to be taken during implementation and operation, i.e., for both pre-mining operations, to eliminate, offset or reduce adverse environmental impacts at acceptable levels. It further provides a means of carrying out the environmental protection obligations of the investor**.**

The management plan must identify and summarize all the significant adverse environmental social impacts that impact that are anticipated; described and give technical details for each mitigation measure, including the type of impact to which it relates and the conditions under which it is required; presentation of institution arrangements – the conditions under which it is required; presentation of institutional arrangements – the assignment of the various responsibilities for carrying out the mitigation measures (e.g. responsibilities which involve operations Supervision, enforcement); monitoring of implementation schedule and monitoring and reporting procedures; and finally, cost estimates and sources of funds for both the initial investment and the recurring expenses for implementing the mitigation plan.

Environmental Screening Tests

Screening tests are a series pf simple questions applied to the project, which may or may not be answered by preliminary impact assessment. However, every effort should be made by the host countries to have them answered. Examples of screening tests which may be applied to a new mine development include, questions concerning major health hazards associated with the development of the new mine; disturbance of existing communities with regards to way of life; extent of land-use disturbance; effects on agriculture and forestry production; effect of the development on water supply and quality; questions concerning secondary environmental effects, such as, greater pressure on fuel wood, sewerage disposal by increased worker population and migration to the area ; effect on social and health services; environmental benefits of development; and measures that the developer proposes to take so as to mitigate or control any impacts.

Public Participation

It is recommended and extremely desirable and necessary that the public be involved and kept informed during all stages of the development. This is extremely important especially, where the socio-economic impacts are large and a considerable amount of people may be affected by the impacts.

Mineral Resources and Mine Life

An outline of the general geology and the associated minerals should be provided by the company. This should be accompanied by details of geological reserves, grade, and extent of mineralization. Waste to ore ratio must also be included, along with the scheduled rate of mining and the expected

life of the mines. This will assist policy markers in charting out a new plan action for indigenous workers and other citizens whose livelihood depend on the mining company.

Clean-Up Reclamation-Restoration and Rehabilitation Requirements

Land restoration and reclamation involves re-grading and landscaping of soil heaps, pits, disused industrial areas and other mine associated abandoned areas. It often requires the re-establishing of drainage patters, road and buildings. At times, land is reclaimed for the building of industrial estates. The aim of hand restoration is to reduce pollution, restore the land landscape and improve the aesthetics of the environment.

Although there are several ecological restraints, the aim of land restoration is to restore the land to its state prior to disturbance. It is usually very difficult if not possible to restore the same type of diversity of species on soil, which has been disturbed as a result of mining. Topsoil and substrate may be so toxic that planting any type of vegetation may be impossible or very difficult. Restoration could also be considered as an opportunity to improve the productivity of the site**.**

It is therefore very essential that before any mining takes place the following preliminary investigations must be conducted : (a) mapping: mapping is used to map out areas of direct and indirect environmental degradation. This makes it easier to carry out land reclamation and restoration; (b) geological investigations: these investigations should take into account all rock formations which may influence reclamation, particularly, overburden formations, soil formations, gangue material (waste) and mineral ore. Other preliminary investigations should include, hydrological investigation, meteorology and climatological investigations, soils survey, bio-data collection, land infrastructure inventory, disruption of mining operations and sociological studies**.**

The enforcement of appropriate legislation along with the introduction of some of the recommendation presented in the text should ensure that reclamation requirements are observed at all stages of the programming, designing and implementation of mining projects. Reclamation projects should be further designed by trained experts and should be accepted by local administrative authorities before implementation. A system of government controls should be put into place so as to ensure that reclamation is carried out.

Monitoring Requirements

Monitoring of environmental impacts and control measures during a mining project is very essential to maintaining a minimum level of environmental damage. It is one of the few ways by which government institutions responsible for monitoring can be assured that the procedures, practices and standards established in legislation or agreed unpredicted impacts to be detected at an early stage. Who monitors the various types of operations vary from country to country. Sophistication of technology and trained manpower requirements for monitoring are also major considerations. The State must have the capacity to check whether the developer is complying with its environmental projection obligations.

The legislation is often specific. That is, if a particular industry is part of a development, then, that legislation comes into force and certain standards and monitoring procedures must apply. Monitoring is also a key activity in preventive health care because it is the only means of checking the degree of exposure to hazards and the effectiveness of the preventive measures taken. Environmental monitoring deals with monitoring the impact of chemical exposure on workers in the work environment.

The mining company's operations should be monitored by its staff or by government authorities to confirm the validity of impact predictions; demonstrate compliance with regulations; identify any unforeseen effects; and determine whether remedial action is required.

Physical variables and frequency of monitoring will vary significantly with the types of mining projects, but it is important that no matter what the mining project is, monitoring should cover contaminated water discharges, any significant land disturbances (flora and fauna), disease patterns and nutrition of the employees and the community (World Bank, 1991).

The competent authority should be in a position to survey the installation regularly in order to ensure that conditions under which the authorization was issued are being met. It should be in the position to enforce the provisions of the authorization and, if necessary, to suspend or revoke it. In monitoring, it is essential to build up a strong government expertise on industry matters. In many, if not most African developing countries, it is a paradox to observe the difference between emphasis on the symbolic paraphernalia of government participation and almost complete neglect on practical attention to the investment project.

The key to effective supervision is the establishment of coordinated, continuous and technically qualified task forces specializing in the particular industry at stake. Such task forces have to include all government agencies involved. The expertise of soil scientists, geologists and engineers will also be needed for the evaluation of appropriate sites, so as to advise on the management of the projects and to devise realistic and worthwhile monitoring programs.

Finally, an important instrument of monitoring is the reporting requirement. Any mining agreement between the government and a national or foreign corporation should require the project enterprise to submit reports to the government about the supervision of he environmental impact of mining activities. Their report should include all environmental considerations. The host country should also have he right to inspect the mining concession and review the files of the project enterprise. This right should be complemented with the authority to examine technical documents and to conduct scientific test and measurement activities. Reporting and inspection by the host country are really central to the carrying out of monitoring functions. These ensure that the environmental protection laws and regulations (as translated into specific obligation in particular mining operations) are complied with.

Even in the most elaborate system of monitoring, the environmental effects of mining operations may remain ineffective if, in the case of non-compliance by the project enterprise the responsible host country authorities do not dispose of the necessary administrative means for compelling adherence to such standards. The criminal penalties and the coercive measures enumerated in the national mining legislation of host countries generally only provide protection in cases where the

natural environment of the mining area is seriously endangered. Thus, when drafting any project agreement in an African developing country, the host country should seek to institutionalize additional administrative instruments, which will allow the state authorities to enforce compliance with environmental provisions and standards in every case of infringement.

CONCLUSIONS

Both large and small-scale mining in African developing countries have often produced adverse environmental impacts. Attempts to control these impacts are now one of the most serious concerns. Despite many efforts, the human and environmental costs of operations have often been great. Many developing countries are now paying the cost of tackling the environmental and health problems caused by adverse mining activities.

African countries must improve and protect the quality of their environment through appropriate legislation and effective monitoring of mining operations by government staff and technicians. These countries must also devote a fair share of their resources to the development of trained staff and skilled workers.

Government must take all necessary steps to ensure adequate compensation by foreign and national corporations for injury to persons or damage to property caused by the effect of operations and minimize environmental damage including pollution of surface and ground waters, land contamination, air and noise pollution, disruption to natural drainage and damage to archaeological and cultural sites. The "polluter pays principal" must be employed for environmental damages. Under this principal, producers of waste are liable to third parties without proof of fault for damage caused by their waste, until the waste is consigned to a third party licensed to dispose of it.

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