

AN ASSESSMENT OF THE BENEFITS AND COSTS OF BLACK GRANITE QUARRYING IN MUTOKO DISTRICT, ZIMBABWE: A SOCIO-CULTURAL, BIOPHYSICAL AND ECONOMIC APPROACH

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ABSTRACT

Mining plays an important role in the socio-economic development of many countries worldwide. However, in spite of its remarkable contribution towards development, mining can also result in some adverse impacts, especially when carried out without proper planning. In this study, the economic, socio-cultural, and biophysical benefits and costs of black granite quarrying were investigated. Two questionnaires, one targeting quarry workers and the other targeting villagers around quarry sites, together with personal interviews with key informants, were used as data gathering instruments. Among the benefits realized in the study area due to black granite quarrying include employment creation, infrastructural development, and revenue generation. Black granite quarrying has also brought with it some costs to the study area including, *inter alia*, the creation of labor bottlenecks for peasant agriculture, encroachment onto limited prime agricultural land, and the lowering of water tables. Quarrying has also induced some school dropouts, while HIV/AIDS prevalence has reportedly increased with the establishment of the quarries. The study recommends that full Environmental Impact Assessments should be carried out immediately in order to fully identify and enhance the benefits of black granite quarrying and reduce the costs.

Keywords: black granite quarrying, benefits and costs, sustainable development.

INTRODUCTION

The history of mining in Zimbabwe dates back to the 15th century when the people practiced traditional small-scale mining mainly for iron and gold. This fact is evidenced by the existence of iron tools and dealings in gold trade with the Portuguese during the Monomotapa Empire era (Svotwa & Mtetwa, 1997). Modern mining in Zimbabwe, however, started at the turn of the 20th century when a re-examination of more than 4,000 old workings by the British South Africa Company (BSAC) led to the development of a number of important gold mines (Viewing, 1984).

Mining plays a very crucial role in the development of Zimbabwe. The sector plays a key role in terms of foreign exchange, gross domestic product (GDP), government revenue, and capital formation (Chenje, Sola & Paleczny, 1998). For example, in 1990, the country derived 42 percent of its foreign exchange from mineral exports, 6 percent of its GDP, while 5 percent of its labor force was employed in the mining sector (Government of Zimbabwe, 1991).

In addition to the direct economic importance of the mining industry to Zimbabwe, the sector has also been influential in the infrastructural development of the country. The mines that were re-examined and developed by the BSAC, then, formed important centers of commercial activity and eventually developed into permanent communities with basic infrastructure such as water, communication, health, education, electricity, and, ultimately, local government. A natural sequel was that these nuclei of economic activity mushroomed into what are now the present-day towns in Zimbabwe linked by roads, railways, and other communication links (Viewing, 1984).

In spite of the remarkable contributions that mining has made towards the development of Zimbabwe and other parts of the world, its history is marred by a legacy of negative impacts. Among the negative impacts of mining include: the destruction of the natural landscape, pollution of surface and groundwater resources, contamination of soils, erosion and disturbance of local vegetation, disturbance of ecosystems and displacement of local wildlife, creation of ghost towns, and impingement of human health and safety, including extreme cases of death of mine workers through accidents at work (Kesler, 1994; Eaton, 1996). For example, in 1988 it was estimated that mining in Zimbabwe was responsible for moving at least 85 million tons of soil and rock (Ministry of Natural Resources and Tourism, 1988). On February 1, 1998, a tailings dump at How Mine failed after a heavy downpour and flowed into the local river systems. To ameliorate possible cyanide contamination of the water systems, the mine spent about Z \$20 million in a clean-up operation (United Nations Environment Programme, 2001). In June 1972, 427 workers perished underground at Wankie Colliery when an explosion occurred in the morning shift (Eaton, 1996).

Increasing demand for black granite, particularly in the construction industry, has led to the development of extensive quarrying operations in Mutoko District. The establishment and expansion of black granite quarrying activities in Mutoko has transformed the district into an important mining area of the country. Before this, Mutoko was not known for any major mining activities. While no comprehensive research on the impacts of black granite quarrying in the study area has been conducted, isolated reports by various stakeholders, including communities around quarry sites, have pointed to various negative impacts. Other stakeholders have also questioned whether there are any positive impacts that current black granite quarrying operations could be

bringing to Mutoko District. In an attempt to rank the country's 57 districts in terms of level of socio-economic development using multiple component analysis, Chazireni (2003) ranked Mutoko District among the ten least developed districts in Zimbabwe. The presence of black granite in Mutoko could act as a springboard for socio-economic development. However, this can only be fully realized by, firstly, establishing the impacts of current black granite quarrying operations in the area, which, to date, are not comprehensively known, and then come up with measures to enhance the positive impacts and reduce or, where possible, eliminate the negative impacts. This study seeks to assess the economic, socio-cultural, and biophysical benefits and costs of black granite quarrying in Mutoko District. It also suggests some recommendations in order to ensure that black granite quarrying contributes towards the sustainable development of the district.

DESCRIPTION OF THE STUDY AREA

Mutoko District is situated 103 kilometers to the northeast of the capital, Harare. It is one of the nine administrative districts of Mashonaland East Province. According to the 2002 national population census, Mutoko District had a resident population of 119,746 people (Central Statistical Office, 2002).

Zimbabwe has a total land area of 390,757 km², falling within four main physiographic regions. These include the Eastern Highlands over 1800 m above sea level, the High-Veld between 1200 – 1800 m and descending towards the Zambezi River in the north and the Limpopo River in the southeast, the Middle-Veld (600 – 1200 m) and the Low-Veld (below 600 m). Mutoko District lies within the Middle-Veld. The country is also divided into five agro-ecological regions which have provided the basis for land use planning with Region One, being the most suitable for diversified agriculture with rainfall above 1000 mm per annum, while Region Five is only suitable for livestock production and game ranching due to erratic rainfall. Most parts of Mutoko District lie within Region Four, with 450-650 mm of rainfall characterized by periodic seasonal droughts and severe dry spells during the rainy season. Some few patches of the district, particularly in the south, lie within agro-ecological Region Three (500-750 mm), characterized by mid-season dry spells and suitable for drought resistant crops, livestock, and semi-intensive farming (Moyo, Sill & O'Keefe, 1993; Chenje, Sola & Paleczny, 1998).

The major geological formations in Zimbabwe are classified into 10 hydrogeological groupings, each characterized by almost unique hydrogeological values. Mutoko District falls within the Granite/Gneiss rocks, which cover approximately 53 percent of the country's land surface mainly in the eastern half of the country. Primary porosity in these rocks is so minute that it is assumed not to contribute to groundwater movement and storage. Groundwater, therefore, occurs in the weathered zone where the rocks are buried deeper underground (Chenje, Sola & Paleczny, 1998).

Mutoko District is dominated by Paraferrallitic soils derived in situ from igneous and metamorphosed igneous parent rock. These are sandy soils which are naturally infertile due to low nutrient reserves and little capacity to retain the nutrients due to low levels of clay and organic matter (Thompson & Purves, 1978). The major economic activity in Mutoko District is peasant farming.

RESEARCH METHODOLOGY

This study was conducted over a period of four months between August and December 2009. Two questionnaires, one targeting the workers at the quarry sites and another for the villagers around the quarry sites, were designed. The questionnaires were administered in the field with the help of trained field workers.

Out of a combined workforce of approximately 3,000 workers employed by the 13 quarrying companies in the district, a total of 400 workers, constituting 13 percent of the workforce, were sampled using proportional representation. Simple random sampling was employed in picking respondents. Information sought included, *inter alia*, level of education, job description, area of origin, working conditions, including remuneration and workplace health and safety, and marital status. The economic, socio-cultural, and biophysical benefits and costs of black granite quarrying, and how best to maximize and minimize them, respectively, was also part of questionnaire content.

For the villagers, a total of 150 households were interviewed and these constituted 12 percent of the estimated target population of 1,200 households within a 30- kilometer radius of the quarries. Households were also selected using simple random sampling which gave every household within the targeted population an equal chance of being included in the sample. In addition to background information about the villagers, the questionnaire also solicited for information on the perceived benefits and costs of black granite quarrying to these communities.

Structured interviews were held with a representative from each of the 13 black granite quarrying companies, a representative from each of the 4 black granite processing companies in Harare, the Chief Executive Officer for Mutoko Rural District Council, workers committee chairpersons for the various quarrying companies, school heads for surrounding schools, and, lastly, village headmen who are the custodians of culture.

Responses to the questionnaires were calculated into percentage frequencies. Information sought through structured interviews was used in corroboration with that generated through the questionnaire surveys.

RESULTS AND DISCUSSION

The Economic Benefits and Costs of Black Granite Quarrying in Mutoko District

Economic benefits

One of the major economic benefits brought about by black granite quarrying in Mutoko District is that of employment creation. The 13 quarrying companies have a total work force of about 3,000 workers. Of these, approximately 80 percent are from within the district, with the remaining 20 percent coming from other parts of the country. Seventy percent of those workers coming from within Mutoko District lived within a 30-kilometer radius from the various quarry sites. This clearly shows that most of the job opportunities have been taken up by people from within the district, and more specifically, by those near the quarry sites.

The major activities involved in black granite quarrying include sampling, excavation, stone quality assessment, stone measurement, drilling, blasting, washing, transportation, and finally processing in Harare. Most of these activities can absorb unskilled labor, thereby creating employment opportunities for less educated locals. As the rural economies of Zimbabwe and many other developing countries of the world are largely dependent on peasant agriculture, black granite quarrying in Mutoko has afforded an opportunity for off-farm employment, thereby diversifying the economic base of the area.

An assessment of the uses of the income from black granite quarrying employment was attempted. Some of the income has been used to replace pole and dagga houses with more modern houses made of brick and asbestos or metal roofing sheets. Some of it has been used to construct pit latrines and protected wells. This has significantly improved the hygiene standards of the people, standards which often dodge rural societies, thereby improving the living conditions of the people. Others have increased their livestock herds, a resource often viewed as a symbol of wealth among rural societies. Households with family members working at the quarries have also generally improved their food security situation by, firstly, being able to purchase agricultural inputs, and on time, and secondly, by affording to outsource food from other parts of the country during drought years.

While black granite quarrying has created employment opportunities in Mutoko District, several sticking points cannot go unnoticed. Firstly, most of the locals who have secured employment are unskilled and, therefore, lowly paid, leaving most of the skilled jobs to people from outside the district. Seventy-five percent of the interviewed workers consisted of unskilled labour while only 25 percent were skilled. However, only 5 percent of the skilled workers were from within Mutoko District. Couple this with the fact that 70 percent of the wage bill was consumed by skilled workers leaving the majority of the workforce scrambling for the remaining 30 percent. It is, therefore, not surprising when 90 percent of the interviewed workers said that they were not happy with their

remuneration. The average monthly income of interviewed workers was US \$70, which falls far below the poverty datum line of US \$300 per family of six. The average family size for interviewed married workers was as high as eight.

Secondly, there is no value addition or processing of the black granite at the quarry sites or at the growth point. This means that a lot of jobs that could have been created within the district through the processing of the rock are 'exported' to Harare. Even in Harare, only about 30 percent of the black granite is processed into finished products, such as floor tiles, wall tiles, tabletops, and tombstones, among others. The rest is exported, only after being sliced into thin slabs for easier handling, mainly to Italy, Germany, and other European Union countries. This exposes the developing- country syndrome of exporting low-value, high-bulk raw materials and if this does not change, developing countries, like Zimbabwe, will always be developing. A manufacturing capacity, which will add value to raw materials before exporting, is what Africa needs instead of charity or foreign aid. Whatever foreign aid Africa gets should be geared towards enhancing this capacity to transform its huge endowment of raw materials into finished products ready for use anywhere in the world. Such a message should be sent to Africa's development partners.

Besides employment creation, another economic benefit from black granite quarrying is that Mutoko Rural District Council gets revenue from quarrying companies in the form of a development levy. For every ton of black granite mined out and transported to Harare, the council gets US \$5. Considering the fact that the quarrying companies sell the same ton at, on average, about US \$1,800, the development levy is unacceptably too low. The all-powerful Mines and Minerals Act controls all the mining activities in the country, including the issuance of mining claims and the claiming of royalties. Whenever and wherever a mineral is discovered, the act overrides all other acts, such as the Rural District Councils Act, and all authorities, such as the Rural District Councils, and all other land uses, such as farming. In the latter, compensation is only paid for infrastructure on the land and not for the land itself. Thus, while rural district councils are the *de jure* planning authorities in their areas of jurisdiction, mining companies bypass them because of the Mines and Minerals Act.

Black granite quarrying has also stimulated some vending activities at quarry sites. Vendors from various parts of the district come to sell varied food and clothing items. Other vendors have even established some tuck shops. Such activities broaden the income base of the people, thereby, helping reduce poverty levels. Thirty percent of the interviewed villagers said that they were involved in various vending activities at the quarry sites

Economic costs

Several economic costs in Mutoko due to black granite quarrying were also identified. The excavation and blasting of the black granite in some areas has resulted in the lowering of water tables as extensive underground granite stretches, which had acted as aquifers, are blasted away. Considering the fact that about 63 percent of the interviewed villagers relied on horticulture for income generation, some areas have been devastated economically as gardening wells have dried up. Such a scenario was reported in Nyamuzuwe, Kawazva, and Kowo areas. Couple this with the fact that not all people in the area have directly benefited economically from the establishment of the black granite quarrying operations in these areas.

In some instances, people's land has been taken over either through road construction or due to the actual quarrying operations. The impact of such loss of land to rural households cannot be overemphasized since agriculture is their main economic activity. Twenty percent of interviewed villagers had lost some or all of their land due to quarrying operations. Because of the communal system of land tenure, where farmers do not have tenurial rights to the land, efforts to claim compensation have been unsuccessful with farmers being compensated only for houses and other infrastructure. The all-powerful Mines and Minerals Act has also overridden the rights of villagers to compensation. Ironically, some of the land lost to quarrying is among the most fertile in a district where the soils are largely sandy and infertile.

Black granite quarrying has also removed some of the able-bodied men from the fields to the quarry sites, thereby creating labor bottlenecks for peasant agriculture. This has left women and children to tend the fields and thus, in many cases, further reducing traditionally low yields. The income from black granite quarrying is not always able to offset the reduced agricultural yields thereby, in such instances, compromising food security. Thirty seven percent of interviewed villagers confirmed that black granite quarrying had compromised labor supply on the fields. This leaves women, children, and the elderly, often referred to as vulnerable groups, to take charge of the responsibility of producing food, with obvious consequences on food security for affected families.

In addition to the above costs, other criteria may be used to weigh the economic benefits of black granite quarrying in Mutoko. These may include the finite nature of the stone and foregone future use. It is noteworthy that the black granite that has been quarried away will never be replaced. Will the people have anything left to show to future generations that there once was some black granite in the area except for derelict land and broken down mountains? Foregone future use of the black granite, which might actually have been more profitable, must be factored in by assessing the current economic benefits of black granite quarrying in Mutoko District. Judged by the above criteria, the current economic benefits are just marginal and short term.

The Socio-Cultural Benefits and Costs of Black Granite Quarrying in Mutoko

Socio-cultural benefits

The study also sought to establish the socio-cultural benefits and costs brought about by black granite quarrying in Mutoko. Among the social benefits is that of infrastructural development. Some of the quarrying companies have built classroom blocks at some schools. Such actions complement government efforts to provide education to all children. A cattle dipping facility has also been constructed in the Charehwa area by one of the quarrying companies, thereby improving livestock health.

Gravel roads have also been constructed in several areas which have improved accessibility to areas hitherto inaccessible, such as Makochera and Kawazva. The same roads are also used to transport horticultural produce to Harare and other parts of the country, thereby enhancing horticulture. However, most of the roads are for use by the quarrying companies while villagers benefit only by chance by virtue of being near them. There are also reports that most of the roads to the quarry sites are not surveyed and are also poorly maintained. The roads are also poorly constructed and are characterized by poor alignment, and lack of culverts and gravel. The use of heavy machinery, such as graders, front-end loaders, and heavy trucks, contributes to the rapid deterioration of the roads. An estimated 200 heavy trucks visit the quarry sites every week.

The quarrying companies also occasionally provide free transport to take ill villagers to Mutoko General Hospital. Such a service is crucial as there are no emergency health services in these areas. Free transportation is sometimes offered to farmers for the transport of their horticultural produce to the market. This increases profit margins as transport costs are eliminated. Food handouts are also occasionally given to villagers, especially during drought years.

However, the above social benefits due to the establishment of black granite quarries in Mutoko have been met with mixed feelings by the local communities. Firstly, these benefits are not commensurate with the huge profits that the quarrying companies are reportedly getting. Secondly, such social benefits are not offsetting the social costs that have also arisen due to the same black granite quarrying operations.

Socio-cultural costs

Among the social costs of black granite quarrying is the increase in prostitution around quarry sites involving quarry workers, vendors, and villagers. HIV/AIDS prevalence has reportedly increased with the establishment and expansion of quarrying operations in these areas. An increase in HIV/AIDS orphans and single mothers in the areas also points to the above problem. Some of the quarry workers come from as far as Harare, Bulawayo,

Mutare, and Masvingo and would have left behind their families. Fifty three percent of the interviewed workers coming from outside Mutoko District were married and left their spouses behind. Such spousal separation exposes the people to infidelity, thereby enhancing the spread of HIV/AIDS.

While quarrying has created employment opportunities for many people, this has also, in some cases, inadvertently translated into a social cost for the communities. Because of the unskilled nature of most of the labor force, some school pupils have opted to drop out of school, hoping to find employment at the quarries once they turn eighteen. And the unfortunate thing is that such a hope is being realized by many of these school children. School dropout cases have reportedly increased in schools around quarry sites. For example, 45 percent of dropouts at Kowo Secondary School were attributed to the above problem. Since unskilled labor attracts low wages, the cycle of poverty in these areas will further be perpetuated as the dropouts' children are also likely to do the same. To make matters worse, such lowly paid jobs will also be based on a finite resource. There is, therefore, an irony that while some of the quarrying companies have helped by building schools, they are, albeit unintentionally, also disrupting the same schools through these dropouts.

Work-related injuries, illnesses and deaths have also resulted from black granite quarrying. The physical nature of the work involved, coupled with poor workplace health and safety standards, have worsened the situation. Some workers have been maimed; others are now chronically ill, while some have died. Considering the fact that compensation to such workers is reportedly insignificant, the social implications for the dependants of affected workers are easily discernible. Injured and ill workers are no longer able to look after their families, while other families have lost sole breadwinners, thereby widening the margin of poverty for such families.

Graves have also been demolished in some areas, especially in mountains, due to black granite quarrying. A classic case is Mt. Murema in Kawazva where human remains have been exhumed through quarrying operations. Among the Shona people, the resting places of departed ones should be treated with utmost respect and many villagers have reacted emotionally to such acts. Quarrying operations have also decimated other sites held sacred by villagers. All this has caused some cultural friction between quarrying companies and villagers.

The Biophysical Costs of Black Granite Quarrying in Mutoko District

Several biophysical costs, due to black granite quarrying, were identified while no single biophysical benefit could be traced. The quarrying activities have led to habitat destruction for various organisms. Most of the quarry sites, particularly in the mountains, used to lurk with leopards, hyenas, baboons, and monkeys, but the first two have completely disappeared with the establishment and expansion of the quarries. High-decibel noise pollution from blasting has driven away these animals. On the other hand, baboons and monkeys, which can

better adapt to human-dominated environments, have had their numbers steadily increase. This domination of baboons and monkeys, and the disappearance of leopards and hyenas, is likely to trigger other unforeseen ecological chain reactions.

As revealed earlier, quarrying operations have led to the lowering of the water table in some areas and the drying up of marshes in others. This is another form of habitat destruction as marshes often support varied life forms. Complex food chains supported by these marshes have disappeared, leading to significant ecological consequences.

The processes of road construction, clearing of working sites, and blasting and transportation of material have all resulted in the loosening up of soil, leading to increased erosion. The above processes, coupled with the destruction of vegetation along mountain slopes, have also led to slope instability, thereby resulting in such geomorphological processes, such as rock falls and mudflows, processes which were not common to these areas. The mass movements and soil erosion have contributed immensely to the siltation of river systems and dams, which are a backbone for horticulture. Some of the materials have also buried prime agricultural land.

A lot of waste is generated during the cutting of rock into right sizes and shapes. Boulders that do not meet the desired requirements and those of poor quality are often dumped at quarry sites. Other sites have been abandoned due to low grade black granite rock. In most cases, no rehabilitation work has been carried out, with abandoned sites being characterized by scattered boulders, open pits, and waste dumps. For example, one of the quarrying companies, BOZIMO, has since left the areas it used to work on without any rehabilitation.

High-decibel noise pollution from frequent blasting, which produces reverberations that can be felt 20-30 kilometers away, has also been reported to have caused the cracking of houses and other infrastructure in nearby areas. This also includes some of the classroom blocks that have been donated by some of the quarrying companies.

Another biophysical problem associated with black granite quarrying in Mutoko is that of improper disposal of used oils at many quarry sites. In addition to polluting the soil, such oils eventually find their way into surface and underground water resources, thereby negatively affecting all the organisms, including humans, dependent on such contaminated waters.

The government of Zimbabwe, through the recently passed Environment Management Act (2004), requires that all major development projects should carry out Environmental Impact Assessments (EIAs) before project

construction in order to identify and mitigate any negative biophysical, economic, social, and cultural impacts that a development project may bring. EIA also aims at enhancing the positive impacts. This is crucial if sustainable development is to be achieved. However, in most developing countries, including Zimbabwe, EIA has not yet been fully and effectively mainstreamed and integrated into environmental policy due to various shortcomings and challenges. In light of the above, the study established that none of the quarrying companies had carried out EIAs before starting their operations, and this is quite disturbing as these are huge operations capable of causing various negative impacts or costs as shown above.

From the preceding, various economic, socio-cultural and biophysical costs due to black granite quarrying in Mutoko have been identified and discussed. These could have been minimized, or eliminated altogether, had EIAs been carried out before the quarrying operations started. Benefits from quarrying have also been identified and these could also have been enhanced through the EIAs. The next section of the article attempts some recommendations on how best to reduce the costs and enhance the benefits so that sustainable development can be realized through black granite quarrying in Mutoko District.

CONCLUSION AND RECOMMENDATIONS

Black granite quarrying has brought about both benefits and costs to Mutoko District. The benefits include employment creation, infrastructural development, and revenue generation for the Mutoko Rural District Council. The costs of black granite quarrying to Mutoko include the lowering of water tables, creation of labor bottlenecks for peasant agriculture, and encroachment onto agricultural land. School dropouts have also been induced, while HIV/AIDS prevalence has reportedly increased since the establishment and expansion of the various quarrying companies. Environmental pollution and habitat destruction also add onto the list of the costs due to black granite quarrying in Mutoko.

The following are some suggested recommendations in order to enhance the benefits from black granite quarrying and reduce the costs in order to ensure that black granite quarrying contributes towards sustainable development in Mutoko. The government of Zimbabwe embarked on the Growth Center Strategy in the early 80s as a way of decentralizing economic development, with Mutoko Growth Point being one of the growth centers. However, this strategy has failed to take off due to various reasons. The presence of black granite could stimulate Mutoko Growth Point into a viable growth center. However, this can only be possible if certain measures are taken. Firstly, there is need to attract black granite processing industries to Mutoko Growth Point. This will create more employment opportunities than those currently being provided by the purely extractive activities. Such value addition will also stimulate related industries and services, such as plant and equipment hire, equipment

maintenance services, manpower development services, among others, thereby creating agglomeration economies of scale. This will eventually transform Mutoko Growth Point into a viable mining town.

Secondly, the Mutoko Rural District Council, as the planning authority of the area, should be given more control over the mining of black granite. This should include the power to offer mining claims to quarrying companies and the claiming of royalties from them. Such a move would strengthen the revenues of the council, which will then, enable it to pursue its development goals more effectively. This, therefore, calls for the amendment of the all-powerful Mines and Minerals Act, which currently controls virtually all mining activities in the country. To that effect, Mutoko Rural District Council has sent recommendations through the Zimbabwe Local Government Association. Such an approach could become a model for all rural district councils seeking to have full control over the natural resources they are endowed with, be they mineral, floral, or faunal. Thirdly, local business people could pool their resources together and form their own black granite quarrying and processing consortia. Such a move will have threefold significance: Firstly, it will mean more economic benefit to the locals from their own resources; secondly, such local entrepreneurs will feel more obliged to plough back some of their profits to the community, their own community, in either cash or kind and; thirdly, the need to attract foreign investors, which is often fraught with many challenges, will be lessened.

Black granite quarry workers in Mutoko should form a strong union through which they can air out their concerns with one voice. They could then affiliate themselves to national level trade unions, such as the Zimbabwe Congress of Trade Unions, in order to have more clout and bargaining power. Such a union will help them solve problems, such as low wages, compensation for injury or death at work, and workplace health and safety, pensions, among other grievances. Currently they have weak and fragmented workers representative bodies.

Quarrying companies should, as a matter of urgency, bankroll HIV/AIDS awareness campaigns targeting their workers, villagers, and vendors in order to stop the spread of the deadly disease. They could collaborate with governmental and non-governmental organizations with vast experience in HIV/AIDS awareness creation and prevention. Construction of houses for workers at the growth point so that they stay with their spouses will help fight the spread of the disease more effectively, in addition to being an employment benefit to the workers.

Quarrying companies should stop destroying graves during their quarrying operations. They should exhume and rebury all human remains within their mining claims in collaboration with the relatives of the deceased. This will help create good rapport between them and local communities. Quarrying operations at or near areas supporting gardens or containing marshes should be avoided. Such selective quarrying will ensure the survival of an

important economic activity in the district, horticulture, while also protecting marshes, which are ecological hotspots.

Last, but most importantly, all the quarrying companies should carry out full EIAs and third-party environmental compliance audits as a matter of urgency and also come up with environmental management plans, including mine closure plans and post closure plans as required by the recently passed Environmental Management Act. The environmental management plans of the quarrying companies should closely be monitored by the Environmental Management Agency in order to ensure that set environmental targets, including the rehabilitation of quarried areas, are met. Performance bonds could be introduced by the Environmental Management Agency in order to ensure environmental security. Quarrying companies failing to perform according to the set of environmental standards will forfeit their money, which will then be used to correct their environmental externalities or, alternatively, they will have their mining rights terminated. This will act as an incentive for environmental protection among the quarrying companies.

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