

RWANDA SKILLS SURVEY 2012



MINING SECTOR REPORT

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List of Acronyms

| | |
|-------|---|
| CGIS | Centre for Geographical Information System and Remote Sensing |
| GOR | Government of Rwanda |
| HCID | Human Capital and Institutional Development |
| HLI | Higher learning Institutions |
| IPRC | Integrated Polytechnic Regional Center |
| KIST | Kigali Institute of Science & Technology |
| NCHE | National Council for Higher Education |
| NSIR | National Institute of Statistics Rwanda |
| NUR | National University of Rwanda |
| OGMR | Rwanda Mining Authority |
| PSCBS | Public Sector Capacity Building Secretariat |
| RDB | Rwanda Development Board |
| SFAR | Student Financing Agency for Rwanda |
| TSS | Technical Secondary School |
| TVET | Technical Vocational Education and Training |
| VTC | Vocational Training Centers |

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Executive Summary

This Report presents the findings of the skills survey of the Mining Sector Establishments in the Private Sector in Rwanda. The focus is on skills profiles, proficiencies, and gaps in the Mining Sector. The survey was commissioned by Rwanda Development Board as a national private sector skills survey targeting 8 priority sectors including ICT, Mining, Energy, Tourism, Manufacturing, Construction, Agriculture, Finance and Insurance. The survey was carried out in the five provinces in the country targeting large, medium, small and micro financial sector establishments in the Private Sector.

Principal Activities and Overall Labor Units in the Sector

The mining sector in Rwanda has 5 principal activities. Extraction of stones is the largest in the sector constituting 61% of establishments followed by mining of metal ores constituting 19.5% and mining support service activities constituting 9.8%. Other activities include retailing of mining products (7.3%) and quarrying (2.4%).

The medium and small establishments dominate the sector, constituting 43.1% and 24.2% respectively. Large establishments account for 17.7%, and Micro ones accounts for 15% of all the establishments in the sector across the country.

The mining establishments in the private sector had 2,616 labor units employed as Managers, Professionals (Engineers), Liberal Professionals, Technicians and Artisans. Women employees in the sector constitute 9.4% of the total labor unit and expatriates are 2.2%. 81% of the expatriates in the sector were noted as Mining Engineers and Surveyors.

Skills Gaps: - The mining sector has a total gap of 2, 721 labor units in the short term. Of these skills gaps 89.9% are skilled Mining Artisans, 4.1% Managers, 2.8% Technicians, 1.4% Liberals and 1.8% Scientists.

These workers in the sector, particularly the 1,500 unskilled artisans who are already operating in the establishments need basic mining skills and basic communication/language (English/French) skills, health and business skills to be more efficient and effective.

Supply of Skills by Training Institutions: - The skills survey indicates that there are no training institutions – universities or IPRCS- in Rwanda that offers mining training programs for professionals and technicians like mine engineers, geologists, metallurgists, geophysicists and geochemists that are demanded in the labor market in the country. Training institutions in Rwanda, universities in particular, have not followed the examples of minerals rich and exporting countries in the region like South Africa, Tanzania, Zambia, Botswana, Egypt and Namibia whose training institutions have specific training programs/courses in Geology and Mining and offer both under- and postgraduate and diploma/certificates.

Although Rwanda currently has no major degree program in Geology and Mining, some of the faculties in higher learning institutions offer basic general courses that could supplement staff needs in the industry. For example, the Centre for Geographical Information System and Remote Sensing (CGIS) at the National University of Rwanda (NUR) which trains students at the postgraduate level could be

beneficial to the mining sector through the provision of maps which indicate the location of certain resources in the country, including minerals. The faculties of science, mostly in the public universities, offer programs in Physics and Chemistry as well as Environmental Studies. These are generic programs, which though not directly tailored for the demands of the mining sector, provide some useful background for further training in areas such as Geophysicists and Geochemists.

There is a proposal by KIST to start a Faculty of Geophysics at the institution. This will require huge resources to establish, operationalize effectively and sustain it.

Although Rwanda mining establishments are still small but fast growing, they face a reality challenge of qualified skills: Technicians and Artisans in particular. The sector will continue to recruit (import) skilled labor in Mining Engineering, Geology, Environmental Studies, Metallurgy and Geotechnical Engineering from overseas, the closest sources being DRC, Tanzania, Zambia and South Africa, Australia. However, the international shortage of such professionals is creating problems for recruitment within Rwanda due in part to the low salary packages currently being offered in the country.

Specific recommendations to bridge skills gaps in the mining sector include the following:

1. Establishment of sector skill council that brings together employers, employees and training providers to address the skills shortage.
2. Promoting University-Industry Linkage in Rwanda.
3. Launching and implementing knowledge and skills development training programs for small scale Miners and artisans.
4. Enhancing qualitative skills among employees in the private establishments.
5. Supporting the training of Mining Technicians.
6. Establishment of a Centre of Excellence for Training in Mining.
7. Establishing specific scholarship facility for mining courses abroad.
8. Promoting public education in mining communities in Rwanda.
9. Supporting IPRCs to launch Mining-related courses.

Furthermore, RDB in partnership with other agencies and stakeholders including MINERENA and Local Government can engage in advocacy and capacity build and empower rural communities, women and youth groups in particular, to develop local skills so that they benefit from the mining sector and contribute towards its growth.

1.0 RWANDA MINING SECTOR

1.1 Mining Policy and Strategies

The Government of Rwanda has identified mineral industry comprising of mining and quarries as a priority sector for development. This is because the country holds deposits of gold, precious stones and small quantities of natural gas, kaolin and peat. In addition, mining and quarries have recorded exceptional growth since 2008.

Rwanda has potential for the following minerals:

- *Metals:* Columbium (Niobium) and Tantalum, Gold, Cassiterite (tin ore), Coltan, Sapphire, Pozzolanic, Wolfram;
- *Industrial Minerals:* Cement, Amphibillite, granites and quartzite, volcanic rocks, clay, sand and gravel; and
- *Mineral Fuels:* Natural gas.

According to Rwanda Mining Authority (OGMR), foreign exchange earnings in 2010 were over 40% from the mining sector. The main mineral export is Cassiterite, which is mined in 26 of Rwanda's 30 districts. Further, in 2010 the mining sector output grew by 34% compared to the growth in 2009. In terms of sectorial contribution to GDP, mining contributes about 2.4% annually.

Table A Selected Sectors contribution to Export Earning in (in Millions USD) 2005-2009

| Sector/Export in millions | 2005 | 2006 | 2007 | 2008 | 2009 |
|--|-------|-------|-------|--------|-------|
| Coffee | 38.3 | 54.0 | 35.7 | 46.91 | 37.3 |
| Tea | 24.4 | 32.1 | 31.5 | 40.05 | 48.2 |
| Minerals (cassiterite, coltan and wolfram) | 37.3 | 36.6 | 70.0 | 94.0 | 54.6 |
| Others | 25.0 | 24.7 | 39.0 | 78.34. | 52.7 |
| Total export | 125.0 | 147.4 | 176.8 | 256.56 | 192.8 |
| % for minerals | 30% | 25% | 40% | 35.57% | 28.3% |

Source: Rwanda Geology and Mines Authority (2010)

The Government of Rwanda (GOR) rated the mining sector as the most prosperous industry in 2011. The sector earned approximately \$150 million, falling behind the tourism sector, which was the top revenue earner in 2011, fetching over \$200 million (Ministry of Natural Resources, 2011).

Besides economic receipts, jobs, and contribution towards the alleviation of poverty in the country, other reasons to focus on the development of the country's mining sector include the potential for infrastructure development, skills development as well as the development of sustainable cooperative-centered communities, preservation of the natural environment and encouragement of private-public sector partnerships and joint ventures ((Republic of Rwanda, 2009).

Review of available documents and discussions with key stakeholders in the sector indicate that some of the key progress made in the last decade includes the following:

- The publication of a new mineral policy 2009;
- The updating of the regulatory framework to keep pace with the rapid privatization of the mining sector since 2004, through the publication of the new Mining Law (2009), which forms a basis for the regulation of the mining industry.
- Establishment and strengthening the capacity of Rwanda Geology and Mines Authority (OGMR) to be able to effectively establish standards and regulate the industry, carry out field surveys and laboratory analysis, and training employees in matters relating to mines and quarries;
- The privatization of government concessions have been completed;
- Promoting the formation of cooperatives and partnerships leading to consolidation and better technical and financial capacities.
- Commencing a voluntary process of certification of the industry to improve the image of the sector by introducing good practices.
- Upgrading the technical knowledge of existing workforce for OGMR and training Rwandan geologists, mining engineers and metallurgists.
- The sector has been able to successfully implement a mineral traceability system, making Rwanda the only country in the region that has achieved that milestone. Research in new minerals like gold also made encouraging stride and the sector was boosted further by explorations that discovered over 20 new mineral-rich sites across the country.

1.2 Challenges

Despite the recent developments, the sector works far below capacity and produces largely at artisan level with attendant negative impact, which goes with such unregulated type of mining. The Rwanda Geology and Mines Authority Strategic Plan 2010 – 2013 identifies the three key challenges, among others: the general dearth of skilled mining engineers, geologists and metallurgists in the country leading to companies to import skilled staff, and the poor knowledge of mineral reserves as well as the post-extraction value addition to minerals and the relatively high cost of energy (Republic of Rwanda, 2010).

1.3 Key priorities and Projects in the Mining Sector

As articulated in the country's mining policy (2009) and the OGMR Strategic Plan (2010), the Rwanda mining industry is currently in a state of transition from a public-run to a private industry. And at the same time, the sector is moving from a regional trading industry to local extraction and exporting industry (Ministry of Natural Resources, 2009).

The 2009 Mining Policy (The Green Paper) provides five strategic outcomes that form the pillars of the new transformed industry. Pillar 3 focuses on “*Improving Mining Sector Knowledge, Skills and Practices*”. This is to be achieved through five strategic interventions:

- ✓ Consolidating existing information on mineral deposits potential,
- ✓ Developing programs for geological surveying,

- ✓ Building human capacity and expertise, and
- ✓ Promoting corporate social responsibility.

The Government of Rwanda has identified the following strategic outcomes in the sector covering the period 2010-2013, with an overall objective of the sector as promoting efficient and environmentally sensitive mineral exploration and exploitation (OGMR, 2010). The strategic outcomes expected in the next 4 years are:

- 1) **Strengthening existing Knowledge, skills and good practices:** - One of the existing means of ensuring that the mining industry has a positive impact in the country is through developing local skills. The locally available expertise in geology, mine engineering or metallurgy is limited and Rwanda will need at least 80 scientists and over 300 mining technicians over the next four years. It is therefore necessary to develop technical capacities by facilitating suitable training for managers, geologists, geophysicists, geochemists, mining engineers seismologists and volcanologists.
- 2) **Strengthening geological and mining research by both the public and private sectors:** - One of the key challenges of the mining sector in Rwanda is the lack of up to date information on its mining potential. The lack of information prevents, key investors from participating. In order to fill this gap and attract investors, essential measures will include: carrying out geological surveys; producing large scale maps in zones of known potential to promote their attractiveness to investors; evaluating prospection by the private sector; establishing the process of geological data certification; and, negotiating partnerships with regional and international institutions.
- 3) **Monitor seismic and volcanic activities:** - The Kigali seismological station is already operational, while 3 other stations are envisaged. It will be important to build partnerships with neighboring countries prone to similar natural disasters as Rwanda to avoid equipment and cost redundancies. This will require recording, analyzing and disseminating seismic information.
- 4) **Participate in the assessment and development of earth energy resources (peat and geothermal):** - OGMR is currently involved in the assessment of the peat resources. Further work is required in quantity and quality assessment of peat bogs and in participating with other relevant institutions in the development of the whole industry. Peat resource has a high potential for being complimentary to wood energy, while geothermal is environmentally clean.
- 5) **Strengthening legal framework and regulatory institutions:** - The mining law was enacted and is being implemented. However, the roles of MINIREMA,

MINICOM, OGRM, District REMA and RBS need to be re-evaluated and spelt out. In addition operational mechanisms need to be created to facilitate the legal application and effectiveness. Application of the law strengthened by the control mechanisms will reduce the informal system, especially with regard to the exploitation and sale of minerals.

- 6) Develop tools to promote investment opportunities in the mining sector: - This strategy will involve two main elements:
 - a) Collection of economic information necessary for entrepreneurs (based on availability of good quality systematic data resulting from collection, analysis and presentation formats appropriate for geoscientists); and,
 - b) Dissemination of such information and awareness building at national and local levels.

- 7) **Involve women and youth in entrepreneurial activities at all levels of the mining sector (extraction, development and marketing):** - The information and awareness raising of those involved in investment in the sector are key to the strategy. Various groups will be sensitized to take part in investment. More importantly, in order to increase the effectiveness of this strategy, women and youth will be targeted for tailored meetings, which will meet their needs. Other institutions/partners willing to augment the achievement of this strategy will be supported.

- 8) **Build operational capacities for artisan and small-scale miners:** - Strengthening the capacity of artisan and small-scale miners is a government policy. Artisan miners are currently being grouped in cooperatives; unions of cooperatives and in a federation of all mining cooperatives covering the whole country to improve production, promote good practices and increase benefits to the actors themselves. This policy will be consolidated and help to put in place support facilities when it is formalized. The strategic plan has devised activities towards this endeavor.

- 9) **Strengthening the environmental sustainability:** - This strategy aims at increasing production in the mining sector in the framework of sustainable development. Inspection of performance of mining companies and artisans by OGMR to ensure a process of adaptation to good environmental practices in mining are provided for. All large mining companies are required to obtain an EIA certificate before a license is given while the small companies will be regularly inspected. A pilot project of mineral certification, whereby a number of good practice guidelines are being audited at volunteer companies has started in the country. The training of OGMR members of staff and private sector in good environmental husbandry will be encouraged.

- 10) **Determination of quantity and quality of competitive quarry resources (industrial minerals and semi-precious stones):** - The full potential of industrial minerals to contribute to the national economic growth, industrial development, job creation and exports is not yet realized. The investments promotion strategy of industrial minerals covers dissemination of relevant economic information (quantity, quality and price) of these minerals. This strategy will focus on generating such information and disseminating it.
- 11) **Promote processing technologies in mineral and quarry resources (industrial minerals and semi-precious stones):** - The establishment of processing units is the only way to increase value addition in the sector. The private sector is responsible for the creation of these facilities with government providing incentives and legislation. OGMR will help this by raising awareness among stakeholders and taking a role in defining exports quality standard. There will also be a possible need for developing appropriate technologies especially in relation to industrial minerals and semi-precious minerals because of possible artisan level involvement (Republic of Rwanda, 2010).

With these outcomes the Government and other stakeholders expect that the mining sector in Rwanda, which has been privatized, will be efficient and effective in production, value addition, marketing, environmental sustainability, and increased earning. The right skills, professional and technical in particular, to effectively manage the achievement of these outcomes are a critical factor in the next 1-3 years.

1.4 Skill Situation

One of the major challenges facing the sector is the shortage of skilled professionals and technicians. In Rwanda, the locally available expertise in geology, mine engineering or metallurgy is limited to roughly 40 scientists of whom only 4 are under 40 years old, raising the issue of mentorship of young professionals to run the industry. It is estimated that Rwanda will need at least 80 scientists and over 300 mining technicians over the next four years (Department of Geology and Mines –OGMR-, 2010). With the rapid growth of the mining sector in the country, supplying and maintaining knowledge reserves of professionals and technicians will remain a major challenge in the next 3 to 5 years.

But what skills currently exist in the private establishment in the mining sector? That is the focus of this report.

2.0 CONTEXT OF THE SKILLS SURVEY

The Rwanda Development Board's (RDB) mandate is to promote private sector development through investment promotion. In order to attract the requisite investment, it is important to ensure that the country has the right quantity and quality of skills to support the emerging and growing industries. The Human Capital and Institutional Development (HCID) Department at RDB supports the private sector by developing mechanisms to ensure there is adequate and availability skills with the right quality. It is expected to address the human capital challenge both from an institutional and individual level, through sustainable interventions. Establishing and running such strategic interventions to fill skills gaps in the private sector requires evidence-based quantitative and qualitative data/information. HCID is committed to supporting interventions that would fill the potential gaps and reconcile both labor supply and demand in the private sector in Rwanda.

2.1 Rationale for the survey

Strategic and sustained investment in skills development requires credible and comprehensive labor market data and information in the private sector and training institutions. Presently, there is inadequate data and information on skills gaps in the private sector and the match and/or mismatch between the supply of skills by various training institutions (TVET and university institutions) and the labor market demand particularly in the priority sectors.

In addition, though RDB has a Labor Market Information system (LMIS), it is still new and hence difficult to know the actual skills needs and gaps of various sectors of development let alone identifying the labor/skills challenges and opportunities the various sectors are facing/having. It is also not possible to conduct medium and long-term labor force forecasting for the various sub-sectors in the private sector. This is mainly because of lack of a series of cumulative credible data and limited use of robust methodological approaches. This skills survey is a strategic start towards building a credible skills database for decision making and planning.

It is from the above context that RDB-HCID commissioned a national private sector skills survey targeting 8 priority sectors including ICT, Mining, Energy, Tourism, Manufacturing, Construction, Agriculture, Finance and Insurance. A regional consultancy firm OWN and Associates Limited, working with the HCID team, was commissioned to lead this strategic national skills survey in the private sector in Rwanda. The survey was launched in August 2011.

2.2 Objectives

This national skills survey targeted the Private Sector in Rwanda, with a focus on:

- ❖ Establishing a robust methodology for strengthening Labor Market Information System (LMIS) and conducting periodical labor market forecasting and manpower surveys.
- ❖ Collecting, collating and reconciling both labor supply and private sector labor demand: establishing sufficient quantitative and qualitative information to identify the potential skills gaps in the private sector.
- ❖ Providing RDB/HCID with comprehensive empirical data on the existing and/or projected human capacity gaps against which training /capacity development interventions and performance can be based, including sustainable and cost effective interventions such as internships, trainings, and scholarships.
- ❖ To conduct a SWOT analysis of respective private sector companies with respect to human capital covering individual, institutional and environment.
- ❖ Provide prioritized recommendations and an action plan that the government and other key stakeholders should undertake to address these gaps.

2.3 Design and Methodology

To carry out a comprehensive, credible and informative skills survey in the selected sub-sectors a rapid assessment methodology, applying qualitative and quantitative techniques was used. The survey was national and carried out on appropriately selected sectors in all the 5 provinces of the country, reflecting both the urban and rural settings. The research team worked with the National Institute of Statistics Rwanda (NISR) to get the right sampling framework and sample size for the skills survey. The NISR Establishment Census 2011 was used as a basis for the selection of the organisations to be visited during the study.

The key respondents during the survey were; employers (owners or/CEOs), employees, and representatives of academic departments of training institutions in Rwanda. The results of the “Establishment Census 2011” conducted by the Ministry of Public Service and Labor, Ministry Commerce and Industry, National Institute of Statistics Rwanda and the Private Sector Federation¹ were used as the framework to determine the sample sizes of the respective sectors for the National Skills Sector Survey.

¹ Republic of Rwanda. (June 2011). *Establishment Census, 2011: Final Results*. Kigali: Ministry of Public Service and Labor, Ministry of Commerce and Trade, National Institute of Statistics Rwanda, and Private Sector Federation.

Based on the Establishment Census 2011 data, NISR worked with the research core team and used a stratified sampling method to select the establishments for the survey across the country. The respondents were stratified using the following 3 criteria:

1. Sectorial activity,
2. Firm size,
3. Geographical location

The stratification by firm size divides the population of firms into a 4 strata as in the Establishment Census, 2011: i.e.

- Micro firms (1 Employee)
- Small Firms (2-3 Employees)
- Medium Firms (4-9Employees)
- Large Firms (10+Employees)

A geographical distribution is defined to reflect the distribution of the economic establishments across the country within the different provinces i.e. Kigali, Southern, Eastern, Northern and Western Provinces.

Sector activity was based on the eight (8) priority sector identified by RDB as part of the terms of reference.

2.4 Sampling framework

The sectors identified by RDB were categorized within the economic activities of the establishment census as shown in Table 1 below. Using the formulae below the sample size was determined for each sector.

$$\text{Using Yamane (1967:888) } n = \frac{N}{1 + N(e)^2}$$

Where N is the population size

n- Sample size

e -level of precision: a precision of 5% was assumed for the skills sector surveys

Weights

To ensure that all sample estimates are reflective of the population parameters, weights for the different strata against the respective sample sizes have been tabulated. These have been reported in the respective sections. Weights have been computed using $w = n/N$, the reciprocal of which will be used to weight the sample results to get the overall population skills status magnitude. All weights have been incorporated in the databases.

Table 1: Sector Survey Sampling Framework

| Sector* | Population** | Sample Size | Sample% |
|-------------------------------------|---------------------|--------------------|----------------|
| ICT (Information and Communication) | 558 | 223 | 40 |
| Energy | 360 | 250 | 69 |
| Mining | 50 | 50 | 100 |
| Construction | 117 | 117 | 100 |
| Tourism | 33,305 | 476 | 1 |
| Manufacturing | 4,559 | 439 | 10 |
| Agriculture | 675 | 282 | 42 |
| Finance & Insurance | 970 | 330 | 34 |

***This population is based on the NISR Establishment Census, 2011 Report*

2.5 Data collection

Through a collaborative process between the research core team, RDB and NSIR , a questionnaire was developed which had a core set of questions along with a series of sector specific modules which directly related to the footprints of each of the sectors. The core set of questions which examined generic recruitment issues, skills gaps, resources for training and future skills needs were drawn from the international skill survey instruments.

For each of the sectors an individual set of questions (or modules) were developed which varied depending upon the priorities of that particular sector. The importance of such an approach was twofold. First, it allowed each of the sectors to gather specific workforce data on organizations which fell into their footprint. Second, it captured the duality of functions that employees often fulfill within private organizations and that would have otherwise not been captured through the more generic core questions.

Given the complexity of the questionnaire and the need to ensure that as many as possible establishments and training institutions within the sector were included in the research, focus groups and telephone interviews were deemed to be the most appropriate, manageable and cost effective method. The interviews were conducted by trained bilingual enumerators.

Experts from RDB and key stakeholders from the selected sectors validated the survey instruments

The number of respondents from the organizations and training institutions are shown in table 2. Experts from RDB HCID, sectoral department, and key stakeholders in each

sector validated the survey instruments and were also involved in focus group discussion and/or interviews

Table 2: Sector Survey Respondents per Sector

| Sector* | Establishments | Training institutions |
|-------------------------------------|----------------|-----------------------|
| ICT (Information and Communication) | 211 | 31 |
| Energy | 243 | 31 |
| Mining | 41 | 31 |
| Construction | 83 | 33 |
| Tourism | 476 | 33 |
| Manufacturing | 439 | 33 |
| Agriculture | 310 | 19 |
| Finance & Insurance | 310 | 19 |

2.6 Report structure

While the surveys were conducted over three phases with at least 2 sectors being analyzed at a time, the reports have been developed separately for each of the eight sectors under review.

The following sections of this report present the **Mining sector** finding and recommendations.

The findings are divided into two parts.

Part 1 (Section 3) presents the composition (profiles) of skills in the mining establishments within the Private Sector in Rwanda that responded to the survey. The occupational structure of current employment in the establishments provides insights into the types of skills employed in the mining sector, while the employment of foreigners and vacancies distributions bear evidence of the skills gaps in the sector and the needs that still exist within the sector.

Part 2 (Section 4) present the potential of training institutions in Rwanda in supplying relevant skills to the mining sector in the country. We also present the challenges facing these institutions that affect their effectiveness and quality of training they offer.

3.0 PART I: SKILLS INVENTORY IN THE MINING ESTABLISHMENTS IN THE PRIVATE SECTOR

The composition of skills in the mining sector was analyzed by looking at the current employment in various establishments within the private sector. The occupational structure of the current employment provides a comprehensive insight into the types of skills profiles employed in the Sector, while the distribution of foreign employees and vacancies is evidence of the skills gaps needed in the establishment and the transformation needs that still exist.

3.1 Mining Establishments Surveyed

Out of 50 establishments in mining sector in the Private Sector, 41 (82%) establishments responded to the survey. A half of the establishments are based in the Western province, Kigali and Eastern have eight each, while Eastern and Southern have four and two establishment respectively. 46.3 per cent are sole proprietorships, close to a third are cooperatives and the remaining 20 percent are incorporated as companies. 80 percent of the establishment are fully Rwandese owned, and the other 20 percent are joint ventures or fully foreign owned.

Table 3 shows the distribution of the establishments in the mining sector which responded to the survey, of which 61.0% were in extraction of stones, 19.5% in mining of metal ores and 9.8% in mining support services activities.

Table 3: Mining Sector Sample Characteristics

| Activities in the Sector Establishments | |
|--|--------------------|
| Activity | % of sample |
| Extraction of stones | 61.0 |
| Mining of metal ores | 19.5 |
| Mining support service activities | 9.8 |
| Retailing of mining products | 7.3 |
| Other mining and quarrying | 2.4 |
| Total | 100 |
| Legal Status | |
| Registered, sole proprietorship | 46.4 |
| Cooperative | 31.7 |
| Limited liability Co. | 19.5 |
| Legally established partnership | 2.4 |
| Total | 100 |

3.2 Profile of existing occupations

It is recognized globally that mining industry has about 120 occupations. In this survey establishments on the existing jobs, which are classified in line with major internationally recognized occupation groups, gave the information on occupations. The establishments were asked to provide information on the staff they employed by occupation/function.

The statistics presented in Table 4 show that the mining industries surveyed had 2,616 employees of whom 245 (9.4%) were women and 57 (2.2%) were expatriates. Women employees constituted 9.4% of the total employees while about 81% of the expatriates were mining engineers and surveyors.

In terms of occupation structure, 3.4% were senior managers, while 1.7% were mining scientists professionals; 4.8% mining technicians, 2.3% liberal professionals, 62.4% artisans/craftsmen and 25.4% were unskilled workers. The above statistics shows the picture of the skills mix, which is defined broadly as the combination or grouping of different categories of workers that is employed for the provision of services. In the mining sector skill mix refers to differences across occupational groups such as artisans and professionals.

The findings show that there was one mining professional to 3 technicians and 38 artisans. Although Lagos Plan of Action indicates that in the production industry there should be one scientist to 5 technicians to 30 artisans, the decision on skills mix should be country specific.

Table 4: Employment by Existing Occupations²

| Function/Occupation | Number | Of which women | Of which expatriates |
|--|-----------|----------------|----------------------|
| 1. Managers | | | |
| Managers (senior management excluding supervisors) | | | |
| Sub-total Mining Managers | 90 | 13 | 45 |
| 2. Mining Professionals | | | |
| Mining Engineers Metallurgists and related professionals | 23 | 3 | 0 |
| Geologists and geo-physicists | 12 | 0 | 0 |
| Cartographers and Surveyors | 5 | 1 | 1 |
| Other Mining Professionals | 4 | | |
| Sub-total Mining Professionals | 44 | 4 | 1 |
| 3. Mining Technicians | | | |
| Mining and metallurgical technicians | 90 | 0 | 0 |

² Mining scientist professionals are holders of bachelor degrees and above. Mining technicians are holders of diploma and advanced certificate, and skilled artisans are holders of certificates from technical and vocational training institutions.

| Function/Occupation | Number | Of which women | Of which expatriates |
|---|--------------|----------------|----------------------|
| Mining technicians | 36 | 6 | 0 |
| Mining and metallurgical technicians | 126 | 6 | 0 |
| 4. Liberal Professionals | | | |
| Finance Professionals (Accountants, Financial analysts, Investment analysts) | 24 | 13 | 0 |
| Administration Professionals (HR, Procurement etc.) | 25 | 7 | 0 |
| Sales Marketing and Public Relations Professionals | 7 | 2 | 0 |
| Lawyers | 2 | 0 | 0 |
| Science and Engineering Associate Professionals | 2 | 1 | 1 |
| Sub-total Liberal Professionals | 60 | 23 | 1 |
| 5. Artisans | | | |
| Clerical Support Occupations (Secretarial, Clerical and other office workers) | 12 | 6 | 0 |
| Customer service occupation (sales staff, retail cashiers, showroom attendants) | 13 | 5 | 0 |
| Skilled Craftsmen/Artisans/Tradesmen (electricians, carpenters, masons, motor mechanics, plumbers) | 1541 | 119 | 0 |
| Plant Operators (incl. drivers, sorters, packers, drivers) | 67 | 0 | 4 |
| Elementary occupations (unskilled workers, messengers, cleaners, gardeners, security guards, waiters, kitchen assistants) | 663 | 82 | 1 |
| Sub-total Artisans | 2296 | 212 | 5 |
| Grand Total- All Employees | 2,616 | 245 | 57 |

Source: Employers Data

3.3 Existing Employment Profile by Sub-Sector

Analysis was undertaken on employment by subsector as presented in Table 4.4. The findings show that large firms in the extraction of stones and mining of metal ores are the major employers of expatriates at professional levels. Out of 90 employees at the managerial/ professional level 45% were expatriates

with 48 of them working in extraction of stones. Women were mainly in elementary occupations and skilled artisans.

3.3.1 Extraction of Stones

(a) Large Establishments: Out of 2,616 employees in the mining sector, large establishments in the extraction of stones employed 939 staff constituting 35.9% of the total employment. Of the 939 employees, managers constituted 5.3%; scientists 1.7%; technicians 8%; liberal professionals 3.5%; skilled artisans 25.7% and elementary occupations 49.6%. Table 5 gives absolute number of employees by occupation. Women account for 11% of the total labor force with expatriates whom are mainly senior managers accounting for 5%.

Table 5: Distribution of Occupations in Large Establishments

| Large Establishments | Existing | Women | Expatriates |
|--|-----------|-----------|-------------|
| 1. Managers | | | |
| Managers (senior management excluding supervisors) | 46 | 0 | 31 |
| Mining Managers | 4 | 0 | 3 |
| Sub-total | 50 | | 34 |
| 2. Mining Scientists Professionals | | | |
| Mining Engineers Metallurgists and related professionals | 1 | 0 | 0 |
| Geologists and geo-physicists | 7 | 0 | 5 |
| Cartographers and Surveyors | 1 | 1 | 1 |
| Other Engineers (civil, mechanical, chemical) | 3 | 1 | 1 |
| Other mining professionals | 4 | 0 | 0 |
| Sub-total Mining Scientists Professionals | 16 | 2 | 7 |
| 3. Technicians | | | |
| Metallurgical technicians | 62 | 5 | 0 |
| Mining technicians | 14 | 0 | 0 |
| Sub-total Technicians | 76 | 5 | 0 |
| 4. Liberal Professionals | | | |
| Finance Professionals (Accountants, Financial analysts, Investment analysts) | 14 | 9 | 0 |
| Administration Professionals (HR, Procurement) | 13 | 6 | 0 |
| Sales Marketing and Public Relations Professionals | 4 | 2 | 0 |
| Lawyers | 1 | 0 | 2 |
| Science and Engineering Associate Professionals | 1 | 0 | 0 |
| Sub-total Liberal Professions | 33 | 17 | 2 |
| 5. Artisans | | | |
| Clerical Support Occupations (Secretarial, | 2 | 2 | 0 |

| Large Establishments | Existing | Women | Expatriates |
|---|------------|------------|-------------|
| Clerical and other office workers) | | | |
| Customer service occupation (sales staff, retail cashiers, showroom attendants) | 5 | 2 | 0 |
| Skilled Craftsmen/Artisans/Tradesmen (electricians, carpenters, masons, motor mechanics, plumbers) | 242 | 9 | 0 |
| Plant Operators (incl. drivers, sorters, packers, drivers) | 49 | 0 | 4 |
| Elementary occupations (unskilled workers, messengers, cleaners, gardeners, security guards, waiters, kitchen assistants) | 466 | 67 | 1 |
| Sub-total Artisans | 764 | 80 | 5 |
| Overall Total | 939 | 104 | 48 |

Source: Employers Data

(b) Medium Establishments: - Medium size establishments reemployed 218 staff of which 204 or 93.6% were skilled artisans. Senior managers accounted for 1.4% while administrative professions and elementary occupation each accounted for 2.3% (Table 6). There were no women and expatriates employees.

Table 6: Distribution of Occupations in Medium Establishments

| Size of Establishments | Existing |
|---|------------|
| Managers (senior management excluding supervisors) | 3 |
| Liberal Professionals (HR, Procurement) | 5 |
| Customer service occupation (sales staff, retail cashiers, showroom attendants) | 1 |
| Skilled Craftsmen/Artisans (electricians, carpenters, masons, motor mechanics, plumbers) | 204 |
| Elementary occupations (unskilled workers, messengers, cleaners, gardeners, security guards, waiters, kitchen assistants) | 5 |
| Total | 218 |

Source: Employers Data

(c) Small Establishments: - There were only 7 employees in the small establishments with six working as skilled artisans and one as a manger. There were no women and expatriates in these establishments.

3.3.2 Mining of Metal Ores

(a) Large Scale Companies: In mining of metal ores, large establishments had 1,294 employees of whom 1,068 or 82.5% were skilled craftsmen, 0.9% were

managers, and 2.3% were technicians (Table 7). Liberal professionals accounted for 1.8% while plant operators and elementary occupations constituted 11.7%. Women accounted for 10% with 84% of them working as skilled craftsmen, expatriates accounted for 0.5% of the total large scale labor force, with most working as senior managers.

Table 7: Distribution of Occupations in large Mineral Ore Establishments

| Size of Establishments | Existing | Women | Expatriates |
|---|---------------|------------|-------------|
| 1. Managers | | | |
| Managers (senior management excluding supervisors) | 6 | 0 | 6 |
| Mining Managers | 6 | 2 | 0 |
| Sub-total Managers | 12 | 2 | 6 |
| 2. Mining Technicians | | | |
| Mining and metallurgical technicians | 6 | 1 | 0 |
| Mining technicians | 24 | 0 | 0 |
| Sub-total: Mining Technicians | 30 | 1 | 0 |
| 3. Liberal Professionals | | | |
| Finance Professionals (Accountants, Financial analysts, Investment analysts) | 6 | 2 | 0 |
| Administration Professionals (HR, Procurement) | 4 | 2 | 0 |
| Sales Marketing and Public Relations Professionals | 14 | 1 | 1 |
| Sub-total: Liberal Professionals | 24 | 5 | 1 |
| 4. Artisans | | | |
| Clerical Support Occupations (Secretarial, Clerical and other office workers) | 4 | 2 | 0 |
| Customer service occupation (sales staff, retail cashiers, showroom attendants) | 5 | 2 | 0 |
| Skilled Craftsmen/Artisans/Tradesmen (electricians, carpenters, masons, motor mechanics, plumbers) | 1068 | 110 | 0 |
| Plant Operators (incl. drivers, sorters, packers, drivers) | 9 | 0 | 0 |
| Elementary occupations (unskilled workers, messengers, cleaners, gardeners, security guards, waiters, kitchen assistants) | 142 | 8 | 0 |
| Sub-total: Artisans | 1, 228 | 122 | 0 |
| Total | 1, 294 | 130 | 7 |

Source: Employers Data

(b) Small Establishments: - The distributions of occupations are given in Table 8. There were 42 employees in the small establishments of the Mining of metal ores. Of the employees, 12% were managers, 42.9% were in elementary occupation. Women employees constituted 7.1% and there were no expatriates.

Table 8: Distribution of Occupations in Small Mineral Ore Establishments

| Occupations | Existing | Women |
|---|----------|-------|
| Managers (senior management excluding supervisors) | 5 | 0 |
| Mining and metallurgical technicians | 1 | 0 |
| Other Engineers (civil, mechanical, chemical) | 1 | 0 |
| Finance Professionals (Accountants, Financial analysts, Investment analysts) | 1 | 0 |
| Administration Professionals (HR, Procurement) | 1 | 0 |
| Clerical Support Occupations (Secretarial, Clerical and other office workers) | 6 | 2 |
| Customer service occupation (sales staff, retail cashiers, showroom attendants) | 1 | 1 |
| Skilled Craftsmen/Artisans/Tradesmen (electricians, carpenters, masons, motor mechanics, plumbers) | 3 | 0 |
| Plant Operators (incl .drivers, sorters, packers, drivers) | 5 | 0 |
| Elementary occupations (unskilled workers, messengers, cleaners, gardeners, security guards, waiters, kitchen assistants) | 18 | 0 |
| Total | 42 | 3 |

Source: Employers Data

3.3.3 Mining Support Activities

(a) Large Establishments: - Large establishments in the mining support activities had 51 employees as shown in Table 9. Analysis by occupation found that 21.6% of the employees were managers; 43% were scientist professionals while technicians accounted for 25.4% and liberal professionals 9.8% of total employees. Women accounted for 10% and they were evenly distributed between mining managers and finance professionals.

Table 9: Distribution of Occupations in Large Mineral Support Establishments

| Occupations | Existing | Women |
|--|----------|-------|
| Managers (senior management excluding supervisors) | 8 | |
| Mining Managers | 3 | 3 |
| Mining Engineers Metallurgists and | 22 | 0 |

| | | |
|---|----|---|
| related professionals | | |
| Mining and metallurgical technicians | 13 | 0 |
| Liberal Professionals (Accountants, Financial analysts, Investment analysts, and lawyers) | 5 | 2 |
| Total | 51 | 5 |

Source: Employers Data

(b) Small Establishments: - The small establishments employed 6 staff of which 16.7% were managers, 50% scientists, and 33.3% technicians (Table 10). There were no women and expatriates employed by the small establishments.

Table 10: Distribution of Occupations in Small Mineral Support Establishments

| Occupations | Existing |
|--|----------|
| Managers (senior management excluding supervisors) | 1 |
| Geologists and geo-physicists | 1 |
| Mining and metallurgical technicians | 2 |
| Other Engineers (civil, mechanical, chemical) | 2 |
| Total | 6 |

Source: Employers Data

3.3.4 Retail of Mining Products

(a) Micro/Small Establishments: - The information collected from micro and small establishments engaged in retailing mining products shows that there were 7 employees in total of whom 5 were managers and one each in custom service occupation and elementary occupation.

3.3.5 Quarrying

(a) Large establishments: Table 11 gives employment data by occupation. In total there were 52 employees of whom 3.8% were managers, 7.7% mining technicians; 3.8% liberal professionals and 34.6% were skilled craftsmen. Plant operators accounted for 7.7% with elementary occupation accounting for 42.3%. Of the total employees, women constituted 15.4% while expatriates were all managers and constituted 3.8% of total employment.

Table 11: Distribution of Occupations in Large Quarrying Establishments

| Occupations | Existing | Women | Expatriates |
|--|----------|-------|-------------|
| Managers (senior management excluding supervisors) | 2 | 0 | 2 |
| Technicians | | | |
| Mining technicians | 4 | 0 | 0 |
| Liberal Professionals | | | |

| | | | |
|---|-----------|----------|----------|
| Administration Professionals (HR, Procurement) | 2 | 1 | 0 |
| Artisans | | | |
| Skilled Craftsmen/Artisans/Tradesmen (electricians, carpenters, masons, motor mechanics, plumbers) | 18 | 0 | 0 |
| Plant Operators (incl. drivers, sorters, packers, drivers) | 4 | 0 | 0 |
| Elementary occupations (unskilled workers, messengers, cleaners, gardeners, security guards, waiters, kitchen assistants) | 22 | 7 | 0 |
| Overall Total | 52 | 8 | 2 |

Source: Employers Data

3.4 Proficiency in Professional and Technical Skills

3.4.1 Managers and Scientists Proficiency

Employers gave information on how they rate their staff in their core competencies. Table 12 shows that in critical skills the employees' proficiencies were ranked to be low. Mining managers who were ranked as fully proficient constituted only 26.7% and mining engineers 4.3%. 66.7% of the geologists and geophysicists were rated proficient.

Table 12: Rating of Managers & Scientists Proficiency

| Profession | Total Number | Number that is Proficient | Percent Proficient | Gap in Numbers |
|---|--------------|---------------------------|--------------------|----------------|
| Mining Managers | 90 | 24 | 26.7 | 66 |
| Scientists | | | | |
| Mining Engineers Metallurgists and related professionals | 23 | 1 | 4.3 | 22 |
| Geologists and geo-physicists | 12 | 8 | 66.7 | 4 |
| Cartographers and Surveyors | 5 | 1 | 20.0 | 4 |
| Professions in health worker in charge of health and safety | 4 | 0 | 0.0 | 4 |
| Total | 44 | 10 | 25.0 | 34 |

3.4.2 Technicians Proficiency

Table 13 indicates that out of 126 technicians reported; only 50% were fully proficient in their core skills jobs. Metallurgical technicians comprised 43.3% of those reported as being proficient.

Table 13: Technicians Proficiency Level

| Technicians | Total Number | Number that is Proficient | % Proficient | Gap in Number |
|--------------------------------------|---------------------|----------------------------------|---------------------|----------------------|
| Mining and metallurgical technicians | 90 | 39 | 43.3 | 51. |
| Mining technicians | 36 | 24 | 66.7 | 12 |
| Total | 126 | 63 | 50 | 63 |

3.4.3 Liberal Professionals Proficiency

The results show that 81.5% of the liberal professionals were reported as proficient with lawyers followed by sales marketing as presented in Table 14.

Table 14: Liberal Professional Proficiency Level

| Liberal Professionals | Number | Number that is Proficient | % Proficient | Gap in Number |
|--|---------------|----------------------------------|---------------------|----------------------|
| Finance Professionals (Accountants, Financial analysts, Investment analysts) | 24 | 12 | 50 | 50 |
| Administration Professionals (HR, Procurement etc.) | 25 | 15 | 60 | 10 |
| Sales Marketing and Public Relations Professionals | 7 | 5 | 71.4 | 2 |
| Lawyers | 2 | 2 | 100 | 0 |
| Science and Engineering Associate Professionals | 2 | 0 | 0 | 2 |
| Total | 60 | 44 | 73.3 | 16 |

3.4.4 Artisans Proficiency Level

The results of proficiency rating given in Table 15 show that only 21.3% of skilled artisans were proficient. The support occupations, plant operators, customs service occupation and elementary occupations had high rating of 100%, 95.5%, 84.6% and 79.6% respectively.

Table 15: Artisans Proficiency Level

| Artisans | Number | Number that is Proficient | % Proficient | Gap: Number |
|---|---------------|----------------------------------|---------------------|--------------------|
| Clerical Support Occupations (Secretarial, Clerical and other office workers) | 12 | 12 | 100.0 | 0 |
| Customer service occupation (sales staff, retail cashiers, showroom attendants) | 13 | 11 | 84.6 | 2 |
| Skilled Craftsmen/Artisans/Tradesmen | 1541 | 329 | 21.3 | 1212 |

| | | | | |
|---|-------------|------------|-------------|-------------|
| (electricians, carpenters, masons, motor mechanics, plumbers) | | | | |
| Plant Operators (incl. drivers, sorters, packers, drivers) | 67 | 64 | 95.5 | 3 |
| Elementary occupations (unskilled workers, messengers, cleaners, gardeners, security guards, waiters, kitchen assistants) | 663 | 528 | 79.6 | 135 |
| Total | 2296 | 944 | 41.1 | 1352 |

3.5 Competency in Qualitative (Soft) Skills

Employees in the mining sector were asked to assess their competencies in 'soft-skills'. Those who responded to the questionnaire were frank and indicated their level of competencies and expressed their desire to having additional training in order to be more efficient and effective in their work.

Less than 50 per cent of employees indicate that they are very good at communication in the sector. A big number also indicate that they would like to be trained in this skill, especially in communicating clearly business results and reading between the lines to understand business and market dynamics in the mining sector.

The following figures provide a diagrammatic report of the proficiency and training needs in various competencies being assessed.

Figure 1: Communication Skills in Mining Sector

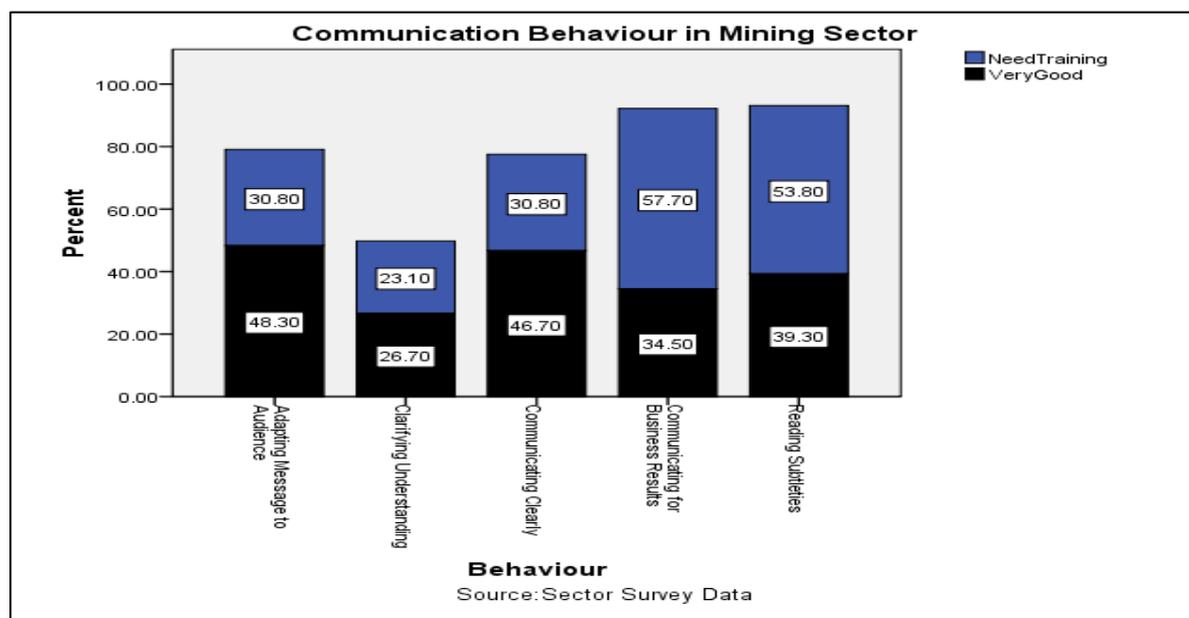
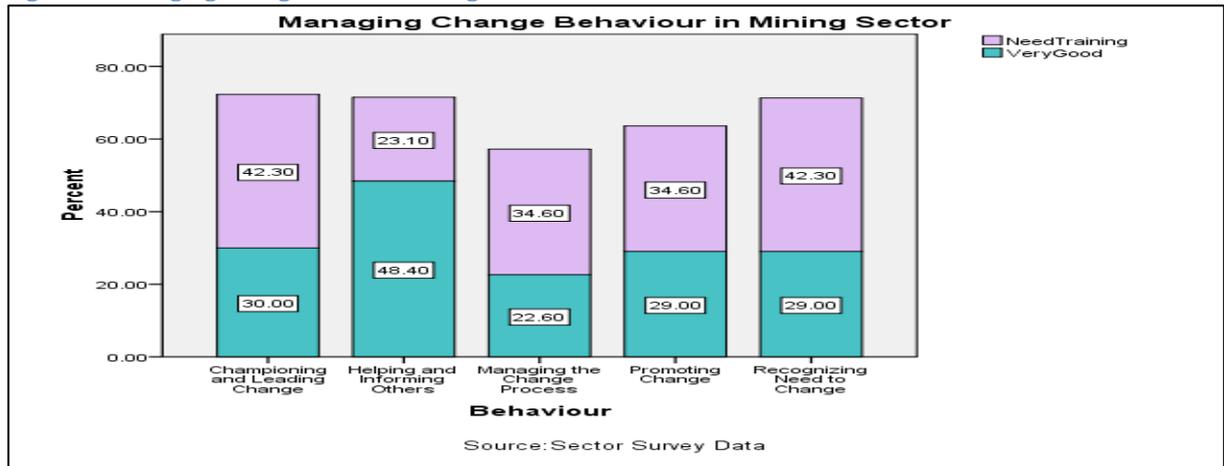
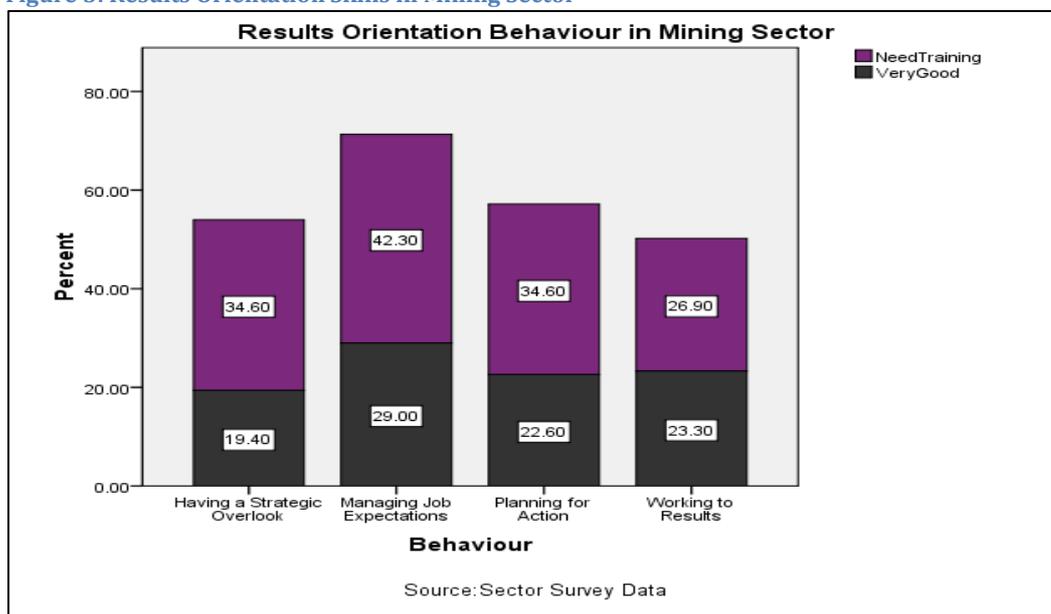


Figure 2: Managing Change Skills in Mining Sector



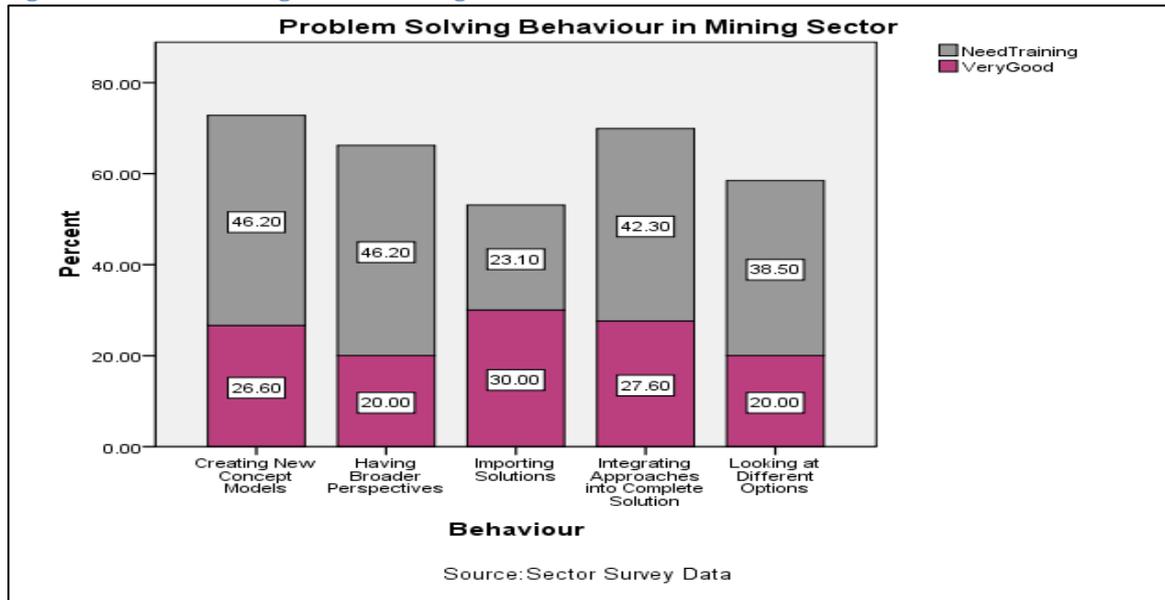
About one third indicated that they are competent in managing change. However, about one quarter of employees indicated that they need training in managing change, especially in championing/leading change and recognizing need for change. These are critical attributes in a fast growing sector like mining in Rwanda.

Figure 3: Results Orientation Skills in Mining Sector



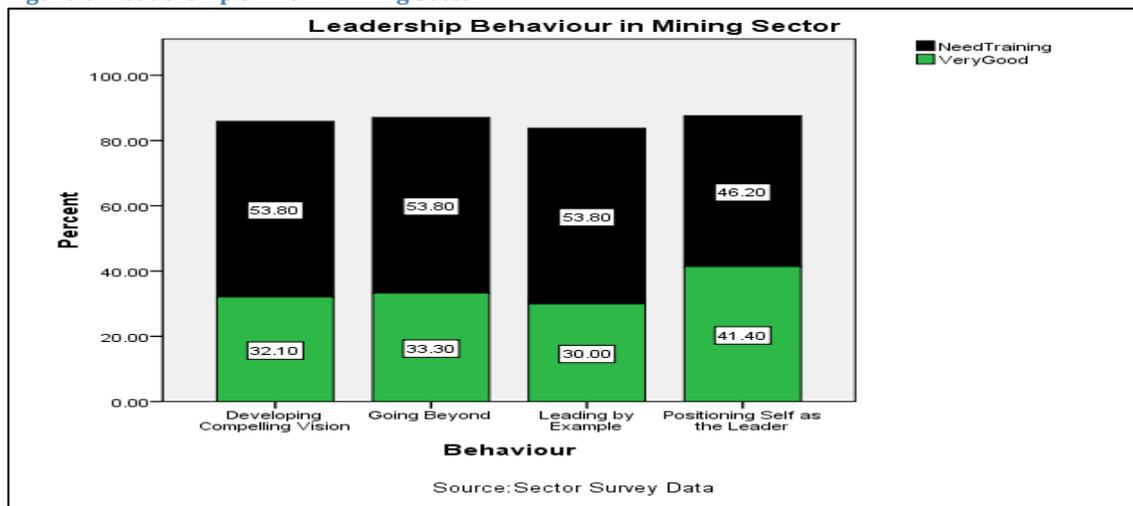
Only about 20% indicated that they are very good at problem solving. But over one quarter would like to be trained in this skill, indicating how critical the skill is in the mining sector in Rwanda.

Figure 4: Problem Solving Skills in Mining Sector



Only one third of employees indicated that they have good competency in leadership, and over 50 per cent would like to be trained on this important quality to enable them to effectively manage their tasks in the mining sector. Risk assessment and management in the sector is a critical quality. But only about 20 per cent employees have a very good competency in this critical quality. The majority, over 60% indicated that they would like training in this area.

Figure 5: Leadership Skills in Mining Sector



Only one third of employees indicated that have they good competency in leadership, and over 50 per cent would like to be trained on this important quality to enable them to effectively manage their tasks in the mining sector. Risk assessment and management in the sector is a critical quality. But only about 20 per cent employees have a very good competency at this critical quality. And the majority, at over 60 per cent indicated that they would like to be trained on it and soon.

Figure 6: Risk Assessment a& Management Skills in the Mining Sector



3.6 Skills Mismatch

Skills mismatch in the mining industry was analyzed based on the information provided by the employees on whether they were assigned the right job according to their qualifications. From the responses presented in Table 4.16, those who were not given the right job according to their qualification constituted only 11.4% while 88.6% highly agreed/agreed that they were given the jobs in line with their qualification

The skills mismatch was reported by 11.4% of the total labor force, this was concentrated among the artisans who accounted for 81.3% and the managers who accounted for 18.8%. (Table 16)

Table 16: Distribution of Occupations with Skills Mismatch

| Occupation | Absolute No | Percentage |
|--------------------|-------------|------------|
| Managers | 55 | 18.7 |
| Diggers | 37 | 12.6 |
| Drillers | 37 | 12.6 |
| Gridding operators | 36 | 12.2 |
| Miners | 74 | 25.2 |
| Plumbers | 37 | 12.6 |
| Sales/Marketing | 18 | 6.1 |

| Occupation | Absolute No | Percentage |
|---------------|-------------|--------------|
| professionals | | |
| Total | 294 | 100.0 |

3.7 Staff Training

Amongst the 41 establishments that responded to the study, 70.7% had never funded or arranged any form of training for its employees whereas 29.3% did so in the 12 months prior to when the study was conducted as shown in Table 17.

Table 17: Establishments' Participation in Training in the Mining Sector

| Training Status | Absolute No | Percent |
|--|-------------|--------------|
| Establishments without Training | 29 | 70.7 |
| Establishments that supported training | 12 | 29.3 |
| Total | 41 | 100.0 |

The training was offered to 176 employees accounting for 6.7% of the labor force in the sector. Of the type of trainings offered 58.3% of the establishments supported job specific training, 16.7%, team building, 8.3% induction and management training as shown in Table 18.

Only 7.3% of the establishments reported to have had a proportion of their annual budgets allocated to training

Table 18: Type of Training Offered

| Type of training | Frequency | Percent |
|-----------------------|-----------|--------------|
| Job Specific Training | 7 | 58.3 |
| Team Building | 2 | 16.7 |
| Induction/Orientation | 1 | 8.3 |
| Management | 1 | 8.3 |
| Unknown | 1 | 8.3 |
| Total | 12 | 100.0 |

The main reasons identified for not offering or supporting training were affordability (31.7%), failure to find relevant training (19.5%), and availability of adequate skills (17.1%) amongst others as indicated in Table 19.

Table 19: Reasons for Not Offering Staff Training

| Reasons for not offering staff training | Frequency | Percent |
|---|-----------|--------------|
| Cannot afford | 13 | 31.7 |
| Can't find relevant training | 8 | 19.5 |
| They have adequate skills | 7 | 17.1 |
| High turnover—we will not benefit | 2 | 4.9 |
| No Reason | 11 | 26.8 |
| Total | 41 | 100.0 |

3.8 Skills Gaps in Mining Establishments

A skills gap is a significant gap between an organizations skills needs and the current capabilities of its workforce .A skills gap analysis is undertaken to identify the skills that employee needs, but may not have, to carry out his or her job or to perform certain tasks effectively. Overall the survey on inventory of skills helps in identifying the gaps in competencies and initiating remedial action. The difference between the existing and expected conditions determines the skills gap.

As a measure of skills gaps for the survey, the employers were asked to give information on the number of vacancies they had and the number they were looking for. In total there were 1,150 vacancies by occupation in the sector.

3.8.1 Critical skills gap by Occupation

(a) Scientists Professionals Critical Gap: - The results of the survey identified the need for 20 scientists as a critical gap, of whom 10 were mining engineers, 7 geologists, 2 metallurgist and one health workers presented in Table 20

Table 20: Scientists Professionals Critical Gap

| Occupation Name | Number of Vacancies |
|--|---------------------|
| Geologists | 7 |
| Mining Engineers | 10 |
| Metallurgist | 2 |
| Health worker in charge of health and safety | 1 |
| Total | 20 |

(b) Technicians Critical Gap:- under occupation for technicians, 12 vacancies were identified and this formed a critical gap as shown in Table 21.

Table 21: Technicians Critical Gap

| Occupation Name | Number of Vacancies |
|---------------------|---------------------|
| Mining technicians | 10 |
| Electro-technicians | 2 |
| Total | 12 |

(b) Liberal Professionals Critical Gap:- The survey indicated that 10 liberal professionals were needed with 50% being accountants, as shown in Table 22.

Table 22: Liberal Professional Critical Gaps

| Occupation Name | Number of Vacancies |
|------------------------|----------------------------|
| Accounting | 5 |
| Lawyers | 2 |
| Head of production | 1 |
| Sales and marketing | 1 |
| Internal Auditor | 1 |
| Total | 10 |

(c) **Artisans Critical Gap:** - The artisans had the highest number of vacancies which stood at 1,079 out of 1,150 vacancies or 93.8% of total vacancies (Table 23).

Table 23: Artisans Skills Gap

| Artisans | Number of Vacancies |
|-------------------|----------------------------|
| Skilled Artisans | 1,079 |
| Unskilled workers | 29 |
| Total | 1, 108 |

Critical vacancies, specifically geologists, had taken over 60 months to be filled. These findings are consistent with the views presented in the 2010-2013 mining sector strategic plan which stated that one of the weaknesses of the mining sector is deficit in geologists, metallurgists, mining engineers and mining economists.

The main reasons given for the difficulties in filling the critical posts were that applicants did not meet the qualifications required and competition from other employers. Some non-critical skills were also found to be vacant and these included elementary occupations and administrative professionals.

3.8.2 Overall Gap in the Mining Sector

The total or absolute gap is considered as the sum of the number of employees who had proficiency gap, number of vacancies (critical gap) and number of expatriates. Table 24 indicates that the mining sector has a total gap of 2, 721 employees, of which 89.9% are skilled mining artisans, managers 4.1%, technicians 2.8% and liberals and scientists having a gap of 1.4% and 1.8% respectively.

Table 24: Overall Skills Gaps by Occupation

| Occupation | Absolute Number | Percentage |
|--------------|-----------------|------------|
| Managers | 111 | 4.1 |
| Scientists | 52 | 1.8 |
| Liberal | 37 | 1.4 |
| Technicians | 75 | 2.8 |
| Artisans | 2,446 | 89.9 |
| Total | 2, 721 | 100 |

Managers and Scientists Professionals Gap: - The results show that there is a total gap 111 managers and 52 scientists professionals in the last 12 months prior to the survey.

Technicians Gap:- In total there was a gap of 75 technicians with the metallurgical technicians having a share of 68% and mining technicians 32%.

Liberal Professionals Gap: -There was a gap of 37 liberal professionals, of which financial professionals accounted for 48.6% and administration professionals accounting for 29.7%.

Artisans Overall Gap: Results indicate that artisans with an absolute number of 2,446 dominate the gap in the mining sector. The artisans are mainly skilled miners who account for 94%, with elementary workers and plant operators taking up the remaining proportion of 6.9%.

Table 25: Breakdown of Overall Skill Gaps

| Occupation | Proficiency Gap | Critical Gap | Expatriates | Total Gap |
|---|-----------------|--------------|-------------|-----------|
| MANAGERS & SCIENTISTS | | | | |
| Mining Managers | 66 | 0 | 45 | 111 |
| Mining Engineers Metallurgists | 22 | 10 | 0 | 32 |
| Geologists and geo-physicists | 4 | 7 | 0 | 11 |
| Cartographers and Surveyors | 4 | 0 | 1 | 5 |
| Liberal profession (Health worker in charge of health and safety) | 4 | 0 | 0 | 4 |
| Total | 34 | 17 | 1 | 52 |
| Technicians | | | | |
| Mining and metallurgical technicians | 51 | 0 | 0 | 51 |
| Mining technicians | 12 | 12 | 0 | 24 |
| Total | 63 | 12 | 0 | 75 |
| Liberal Professionals | | | | |
| Finance Professionals | 12 | 6 | 0 | 18 |

| Occupation | Proficiency Gap | Critical Gap | Expatriates | Total Gap |
|--|------------------------|---------------------|--------------------|------------------|
| (Accountants, Financial analysts, Investment analysts) | | | | |
| Administration Professional (HR, Procurement etc.) | 10 | 1 | 0 | 11 |
| Sales Marketing and Public Relations Professionals | 2 | 1 | 0 | 3 |
| Lawyers | 0 | 2 | 0 | 2 |
| Science and Engineering Associate Professionals | 2 | 0 | 1 | 3 |
| Total | 20 | 10 | 0 | 37 |
| Artisans | | | | |
| Plant Operators | 3 | 0 | 1 | 4 |
| Skilled Craftsmen/Artisans/Tradesmen (electricians, carpenters, masons, motor mechanics, plumbers) | 1212 | 1079 | 0 | 2291 |
| Customer service occupation (sales staff, retail cashiers, showroom attendants) | 2 | 0 | 0 | 2 |
| Elementary occupations (unskilled workers, messengers, cleaners, gardeners, security guards, waiters, kitchen assistants) | 135 | 29 | 1 | 165 |
| Total | 1338 | 1108 | 2 | 2446 |

3.9 Employees Education Level

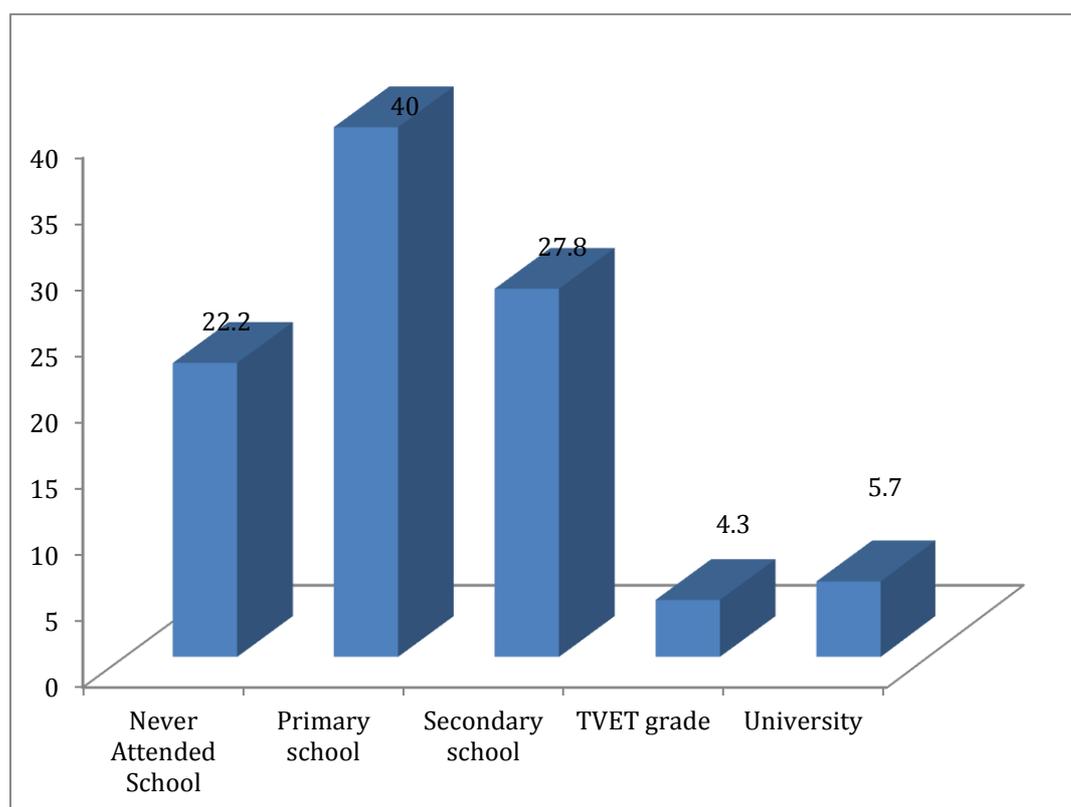
Table 26 and Figure 7 show a profile of employees by highest level of education. All the mining engineers and marketing agents were either university graduates or reached university level of education. The relatively low education among other mining workers reflect the fact that on the job experience is recognized as being pertinent to the lower jobs than qualification. Overall 62.2% of all the employees were of primary school graduate and below.

Table 26: Qualification of Employees by Occupation

| Highest Education | Never Attended School | Attended but didn't finish primary | Primary school graduate | Attended but didn't finish lower secondary | Lower secondary graduate | Attended but didn't finish upper secondary | Upper secondary graduate | TVET graduate | Attended but didn't finish TVET | Attended but didn't finish university | University Graduate | Total |
|--------------------------------------|-----------------------|------------------------------------|-------------------------|--|--------------------------|--|--------------------------|---------------|---------------------------------|---------------------------------------|---------------------|--------------|
| Manager/Supervisor | 0 | 0 | 55 | 0 | 0 | 0 | 18 | 18 | 0 | 0 | 0 | 91 |
| Mining Engineer | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 55 | 55 |
| Driller | 0 | 37 | 55 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 92 |
| Operators | 0 | 0 | 36 | 0 | 0 | 18 | 0 | 0 | 37 | 18 | 0 | 109 |
| Technicians | 0 | 0 | 18 | 0 | 0 | 0 | 18 | 0 | 0 | 0 | 0 | 36 |
| Artisans (Diggers, Skilled Artisans) | 569 | 440 | 367 | 312 | 110 | 18 | 183 | 37 | 0 | 18 | 18 | 2,072 |
| Marketing Agents | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 18 | 36 |
| Customer Attendant | 0 | 0 | 18 | 0 | 0 | 0 | 37 | 0 | 18 | 0 | 0 | 73 |
| Total | 569 | 477 | 549 | 312 | 110 | 36 | 256 | 55 | 55 | 54 | 91 | 2,564 |

Source: Employees Data

Figure 7: Distribution of Employees by Highest Level of Education Attained



The profile of occupations covered above should help learning institutions on the type of courses, which should be provided for mining skills. It should also be borne in mind that mining companies reported that the main barriers inhibiting people from participating in the industry are related to inadequate education, lack of experience and high training costs for new employees who are often not in possession of the required basis skills.

3.10 Mining Private Sector & Training Institutions Linkages

Of the 41 companies that responded to the study, only 34% acknowledged having had interns from training institutions in the country. 66.7% of the interns were university students whereas 33.3% were from TVET/IPRC. However, none of the establishments surveyed had ever had any research or technological partnership/relationship with any training institutions in the country.

The establishments listed alternative potential methods of knowledge acquisitions as indicated by managers of the establishments who responded to the survey. These are indicated in Table 27.

Table 27: Potential Mechanisms of Knowledge & Technology Acquisition

| Mechanisms | Very important | Important | Not important | Unknown |
|--------------------------------|----------------|-----------|---------------|---------|
| Own R&D | 22 | 26.8 | 39 | 12.2 |
| Parent Company/JV partners | 12.2 | 19.5 | 53.7 | 14.6 |
| Equipment suppliers | 36.6 | 36.6 | 14.6 | 12.2 |
| Foreign consultants | 26.8 | 17.1 | 41.5 | 14.6 |
| Local consultants | 56.1 | 19.5 | 14.6 | 9.8 |
| Foreign academic institutions | 14.6 | 19.5 | 53.7 | 12.2 |
| Rwandese academic institutions | 0 | 0 | 75 | 25 |

Source: Primary data

3.11 Earnings by Occupation

Information on earnings was inadequate as only 50% of the establishments responded while the other considered it confidential. The picture of the responses given is presented in Table 28.

The highest earning of the sector are limited to managers and the professionals in the sector. The senior managers earn between RWF 747,000 and 1,212,000 with an average of 1,193,793. The supervisors or managers earn between RWF12, 000 and 1,000,000 with an average of 535,000. The scientist's professionals (Mining Engineers and Geologists) in this sector earn between RWF 909,000 and 1,212,000 respectively.

The mining technicians' earnings are between RWF60, 000 and 606,000 RWF with an average of 348,667. The liberal staff namely lawyers, accountants to mention but a few earn between RWF40, 000 francs and 1,212,000. The lowest earnings in the sector are realized by the elementary and artisans who earn between RWF 500 and 217,214 with an average of 40,000 RWF per month.

Table 28: Earnings by Occupation

| Occupation | Range (RwF) | | Average (RwF) |
|--|----------------|------------------|------------------|
| | Lowest | Highest | |
| Managers | | | |
| Managers (senior management excluding supervisors) | 747,000 | 1,212,000 | 1,193,793 |
| Mining Managers | 12,000 | 1,000,000 | 535,000 |
| Mining Professionals (University Graduates and/or equivalent Internationally Certified) | | | |
| Mining Engineers Metallurgists and related professionals | 909,000 | 909,000 | 909,000 |

| Occupation | Range (RwF) | | Average |
|---|--------------------|------------------|------------------|
| Geologists and geophysicists | 1,212,000 | 1,212,000 | 1,212,000 |
| | | | |
| Mining Technicians and Associate Professionals | | | |
| Other mining technicians | 60,000 | 606,000 | 348,667 |
| Other 1 | | | |
| Liberal Professionals | | | |
| Finance Professionals (Accountants, Financial analysts, Investment analysts) | 140,000 | 606,000 | 388,656 |
| Administration Professional (HR, Procurement etc.) | 140,000 | 1212,000 | 687,200 |
| Lawyers | 140,000 | 606,000 | 433,667 |
| Business and Administration Associate Professionals (finance, HR, sales & marketing) | 40,000 | 240,000 | 142,500 |
| Other Technical/Associate Professional (e.g. health workers, security, paralegals) – specify | 274,650 | 329,580 | 301,410 |
| Artisans | | | |
| Clerical Support workers (Secretarial, Clerical and other office workers) | 12,000 | 217,214 | 98,666 |
| Customer service occupation (sales staff, retail cashiers, showroom attendants) | 12,000 | 150,000 | 100,200 |
| Skilled Craftsmen/Artisans/Tradesmen (electricians, carpenters, masons, motor mechanics, plumbers) | 15,000 | 150,000 | 90,583 |
| Plant Operators (incl. drivers, sorters, packers, drivers) | 70,000 | 135,000 | 82,727 |
| Elementary occupations (unskilled workers, messengers, cleaners, gardeners, security guards, waiters, kitchen assistants) | 500 | 209,124 | 33,441 |

Source: Employers Data

4.0 PART II: SUPPLY OF SKILLS – TRAINING INSTITUTIONS’ CAPACITIES AND SUPPLY OF SKILLS

Experience from countries where mining industry has flourished like Australia, Canada, New Zealand, South Africa, Zambia, Botswana, and Zimbabwe indicate that one of the key means of ensuring that the mining industry is effective and has a positive impact on rural communities and the country as a whole is through the development of local skills.

The fields of study relevant to this sector have been identified in such countries to include Mining Engineering, Metallurgy, Chemical Engineering, Geology, Electrical Engineering, Mechanical Engineering, Analytical Chemistry, Environmental Management, Mine Surveying and Jewelry Design and Manufacturing. Universities and polytechnics and/or technical training institutes in the above countries offer such courses at graduate, diploma and/or certificate course.

4.1 Training Institutions

The skills survey indicates that there are no training institutions – universities or IPRCS- in Rwanda that offers mining training programs for professionals and technicians like mine engineers, geologists, metallurgists, geophysicists and geochemists that are demanded in the labor market in the country. Training institutions in Rwanda, universities in particular, have not followed the examples of minerals rich and exporting countries in the region like South Africa, Tanzania, Zambia, Botswana, Egypt and Namibia whose training institutions have specific training programs/courses in Geology and Mining and offer both under- and postgraduate and diploma/certificate - targeting the mining sector in their country.

Although Rwanda has no major degree program in geology and mining, some of the faculties in HLI offer basic general course that could supplement staff needs in the industry. For example, the Centre for Geographical Information System and Remote Sensing (CGIS) at the National University of Rwanda (NUR) which trains students at postgraduate level could be beneficial to the mining sector through the provision of maps which indicate the location of certain resources in the country which includes minerals.

The faculties of science mostly in the public universities offer programs in physics and chemistry as well as environmental studies. These are generic programs, which though not directly tailored for demands in the mining sector, provide some useful background for further training in areas such as geophysicists and geochemists. However, the mining sector has to compete with other sectors for these graduates.

The National Council for Higher Education (NCHE) that between 2009 and 2010 student enrolments in science and technology in HLI rose from 22,421 to 25,894 whose knowledge could be utilized in the sector in laboratory

analyses. But such graduates would need further training (in-servicing) on geophysics and geochemistry among others, as was reported by two professionals at OGMR, who are former graduates with BSc science and are now working in the establishment's laboratories as geophysicist/geochemist.

Available literature and discussions with various stakeholders in the sector indicates that there has been no investment for the development of specific professional and technical skills for the mining industry in the country for many years despite the fact that mining is one of the fast growing sectors in the country. This explains the existence of skills gaps in the sector in terms of professional and technicians. As indicated by the Department of Geology and Mines (2010), that the locally available expertise in geology, mine engineering or metallurgy was limited to roughly 40 scientists of whom only 4 were under 40 years old. These skill gaps were being addressed, but it was estimated that Rwanda required at least 80 scientists and over 300 mining technicians over the following four years (Republic of Rwanda, 2010).

Rwanda mining sector is fast growing and has been privatized. Its skills requirement in terms of professionals, technicians and artisans can be informed by experiences and practice from countries in the region and abroad. Box 1 summarizes the views of a specialist and mining engineer (a professor who has a wide experience in providing technical support in the development of mining all over the world) when asked by the survey team to give opinion on skills needs that Rwanda must have to prosper and be competitive.

Box 1: Lessons for Rwanda on Skills Required for Mining Sector in

Mining sector in Rwanda is currently mostly artisanal mining on tantalite, cassiterite and wolframite, and some more mechanized small-scale operations on the same type of deposits.

Rwanda has no own mining education at universities, probably there some geology related courses like survey. However, for a mining country like Rwanda, it is important to have training programs to develop local skills. Usually, you need skills in various disciplines and levels, as follows:

High level:

- Geologists, Rock mechanic experts
- Mining Engineers (with special emphasis on safety and environment issues)
- Mineral Processing Engineers

Medium level:

- Mining and mineral processing technicians
- Mechanics and electricians

Low level:

- Miners with training especially in safety
- Machine operators (Excavator, Bulldozer, etc. Processing devices like shaking tables, spirals, etc.)

There are countries in Africa with good mining education and skilled personnel, like Zimbabwe. Many of these have left the country and are working abroad, mostly in South Africa. South Africa itself has a considerable output of mining/mineral processing engineers, but they are mainly absorbed by its own industry. In Namibia, recently a mining education started on

technician level. Unfortunately, the type of mining in these countries is very different from Rwanda.

The type of mining in Rwanda (mostly on weathered pegmatites, some vein-type hard rock mining on wolframite) is somehow rare in general. There are few countries with similar deposits, and then there often the situation is similar as in Rwanda (like Congo, Mozambique). In such situations knowing and getting the right skills mix so as to sustain and monitor the growth of the mining industry is complicated and needs comprehensive study over time, assuming that the security situation and privatization will be normalized.

There are parts of Brazil with similar mines, and also some countries in South East Asia (Thailand, Malaysia, Indonesia) where the deposits are also quite similar. I doubt if currently there exists the possibility to get some trainers/engineers from there to support the privatization and skills development of mining sector in Rwanda.

Prof. Dr.-Ing. Hermann Wotruba
Aufbereitung mineralischer Rohstoffe/Mineral Processing
Germany.
February 2, 2012.

It is not quite clear how many Rwandan students have been trained and continue to train in foreign institutions in geology and mining, but this survey established, as indicated above, that there are vacancies of professional and technical skills mining sector in the next year or 2 years. These include 7 geologists, 10 mining engineers, 2 metallurgists, 10 mining technicians, and 2 electro-technicians and 1 health and safety officer. It is therefore apparent that considering the high costs of establishing training programs locally, Rwanda could continue the current mode of training these scientists abroad as well as developing cooperation for training and exchange programs with regional geology and mineral institutions and joint projects/studies with experienced geology and mineral agencies to acquire advanced skills and best practices.

4.2 Training programs

To strengthen the fast growing mining sector, it is important that some TVET institutions, especially the IPRCs, launch mining sector diploma and certificate training programs for technicians in areas such as geology and environmental technology, hydrogeology, mineral and mining technology. As hardly none of the existing TVET institutions offers related mining programs, IPRCs will require trained instructors and lecturers as well laboratories and equipment in geology, mining and mineral technology.

With regard to the training of artisans to support geologists, mine engineers and technicians, the survey established that the mining sector has a skills gap of 1079 artisans or 62 percent artisans who need to be trained at TSS and VTCs levels in skills such as grinding operators, drillers, diggers and customer service. It is also estimated that there are around 1,500 artisans already operating in the mining sector through cooperatives who have some basic mining skills. However, they lack basic skills in literacy, communication (language –

English/French), and basic skills in health and safety practices, teamwork, and basic business management.

In addition, they could benefit more from the industry through the provision of information on easy to exploit and higher yielding deposits, improving techniques of exploitation, developing initial stage processing activities through training in best practices within the existing cooperatives, and HIV/AIDs education. Such assistance would take the form of “mining extension services” and could be provided for free initially. In the long run there should be a clear plan for the cooperatives and processing companies to pay for such services.

The survey established that to meet the key knowledge and skills requirements, in geology and mine engineering one of the public universities, Kigali Institute of Science and Technology (KIST) is planning set up a faculty of geophysics, which will offer graduate degree programs in geology and mining engineering. Although detailed course programs are being worked out, such programs are normally of a general nature equipping students with knowledge and skills in the mining industry followed by postgraduate studies which provide for some specializations in areas like hydrology, environmental engineering and some aspects of geology.

A typical mining department / faculty requires qualified staff and state of the art facilities for teaching and research, as indicated in Box 2 and Box 3, that could inspire and offer useful lessons to KIST.

Box 2: Department of Geology, University of Botswana – Sample of Mining Program)

DEPARTMENT OF GEOLOGY

ACADEMIC PROGRAMMES

1. Undergraduate
 - a) BSc. Degree in Geology with a **Single Major Program, Combined in Chemistry, Environmental Science, and Physics**
 - b) BSc. Environmental and Engineering Geology
2. Postgraduate
 - a) MSc. Degree in Hydrogeology.
 - b) MSc Geology
 - c) MSc Engineering and Environmental Geology
 - d) PhD Geology
 - e) PhD Engineering and Environmental Geology .
3. **Staffing requirement**
 - Approximately 100 with staff student ratio of 1:6
 - i. Head of Department (HoD), PhD in any Mining areas

- ii. 10 Academic staff specializing in the following areas;
 - Mineralogy
 - Geochemistry
 - Sedimentology,
 - Basin Analysis,
 - Tectonics
 - Regional Geology
 - Structural Geology
 - Economic Geology and
 - Exploration Geology
- iii. Technical Staff
 - Geomapping
 - Thin Section and Polishing
 - Geophysics/Engineering Geology
- iv. Support staff - Administrative , communication, secretariat

4. **Facilities and Resources**

- i. Classrooms/Lecture halls with state-of the art facilities
 - ii. **Research facilities**
 - a) **Natural Hazard Centre**, for seismic hazard studies, mine seismic research, meteorology and the actuarial and insurance sciences.
 - b) **Analytical Facility** containing Sectioning Laboratory, Electron Microprobe-, X-Ray Diffraction and X-Ray Florescence (XRF) facilities.
 - c) Carl ZeissAxioplan 2 Universal Research Microscope with image archiving, retrieval and documentation system
 - d) Scanning Electron Microscope and
 - e) Transmission Electron Microscope
- X-ray Diffraction Laboratory:
- Phillips PW 3710 X-ray Powder Diffractometer with Cu-Ka or Co-Ka radiation and a graphite monochronator. Mineral analysis
 - X-Ray Fluorescence Spectroscopy
- Geochemistry Laboratory:
- Varian Atomic Absorption Spectrometer
 - Multiphase Carbon/Water Determinator,
 - RC 412. Soil analysis.
 - Ion Chromatographer
 - Finnigan MAT ELEMENT 2 ICP-MS with Laser Ablation and HPLC, Geochemical analysis
- Geophysics Facilities:
- GEM System magnetometer Model GSM 19

**Box 3: Assiut University, Department of Mining, Egypt - Sample of a Functioning
Training Institution for the Mining Industry**

A. DEPARTMENT OF MINING

Staffing requirement (36 academic staff)

- 1) HoD
- 2) Academic staff with specialties in the following field;
 - i) Mining Engineering,
 - ii) Mineral Reserves and Resources Estimation,
 - iii) Rock Engineering and
 - iv) Mine Surveying
- 3) Laboratory Technicians
- 4) Support staff: administrative, secretariat and communication

Approximately 100 students with a staff ratio of 1:6

C: ACADEMIC PROGRAMMES

Undergraduate

- a) Diploma in Mining
- b) BSc Mineral Engineering
- c) BSc Mining Engineering

Postgraduate

- c) Master's Degree (MSc.) courses
 - Surface Mining Engineering Technology and Quarries
 - Underground Mining Engineering Technology
 - Drilling Engineering
 - Applied Geophysics
 - Environmental Engineering
 - Rock Mechanics
 - Ore Dressing Engineering
 - Metallurgy and Engineering Material
 - Geodesy and Mine Surveying
 - Blasting Engineering
- d) Graduate Diploma in Engineering (GDE)
mineral economics and rock mechanics
- e) Doctoral degree (PhD) courses
 - Mining Engineering
 - Ore Dressing Engineering
 - Metallurgy and Engineering Material
 - Geodesy and Mine Surveying

D: FACILITIES AND RESOURCES REQUIRED

- a) Computer laboratories
- b) Mining Laboratories
 - Mining,
 - metallurgy,
 - ventilation,
 - photo elasticity,
 - ore evaluation,
 - ore dressing,
 - furnace,
 - rock mechanics,
 - mining surveying,
 - research lab for geological mining,
 - laboratory air floatation,
 - geological engineering lab
 - pollution measurement lab)
- d. Laboratory /Research Facilities
 - 1) Rock Mechanics
 - 2) Rock testing Laboratory
 - 3) Excavation Engineering
 - 4) Mine Ventilation and Climate Control
 - 5) noise and lighting
 - 6) Digital Photogrammetry
 - 7) Mine Design and Computing computer Lab

EQUIPMENTS

- 1) Sample preparation,
 - 2) Uniaxial compressive and shear testing equipment for
 - 3) A set of White Industrial Seismology seismographs
 - 4) 3000 kN, triaxial servo-controlled test machine with temperature control (R1 Million in 1985, upgrade R 1.5 Million)
 - 5) Equipment includes a Newtech **Mine Ventilation** EducatoR
 - 6) a purpose built variable speed centrifugal fan (built to our design by Howden Fans)
 - 7) Hilton Air Conditioning Teaching Unit.
 - 8) A modified Butler shaping machine is used to demonstrate to students the basic concepts of rock and coal cutting
 - 9) The shaping machine
 - 10) standard surveying instruments (levels, theodolites,
 - 11) Specialized mine surveying equipment
-
-

4.3 Training costs

The unit cost for mining course, which would cover only the cost per student covering teaching and learning materials such as books, student accommodation, and expendables is estimated at US \$4,500 in fees, \$70 for accommodation, and \$4,600 tuition which amounts to \$ 8,170 per year and this excludes other supplies, personal expenses and transport.

This also excludes the cost of constructing the infrastructure, which will include lecture theatres, laboratories and equipment.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The survey responses indicate that currently there are no training institutions in Rwanda that offer training programs in mining and there is urgent needs to address skills gaps of professionals, technicians and artisans that are needed in private establishments in Rwanda. Capacity building interventions targeting those already working in the establishments and having a pool of qualified people in the country have implications on how effective and competitive the mining sector becomes in the next 3-5 years.

Although Rwanda establishments are still small and fast growing, they face a reality challenge of acquiring qualified professional skills to survive and prosper. An inadequately skilled workforce is a competitive disadvantage that the growing establishments cannot carry for long. Individual in the mining sector also need skills if they are to find and keep rewarding and well-paying jobs not only in Rwanda and in the region as well. This is a reality with the existence of East Africa Common Market Protocol and the existence of the globalized world.

Several implications for skills development need to be noted:

First, the private sector will have to continue to recruit (import) graduates in mining engineering, geology, environmental studies, metallurgy and geotechnical engineering from overseas, the closest source being DRC, Tanzania, Zambia and South Africa, Australia. Given the international shortage of such professionals, this is creating problems for recruitment within Rwanda due to low salaries currently being offered in the country. Recruitment of forgers implies increasing the cost of production in the mining sector in Rwanda.

Secondly, an effective and growing mining industry also requires low skilled but qualified workers (artisans and other support staff). They need to be numerated and literate, drug-free, have basic health and safety skill, with a good work history and able to withstand difficult working conditions over long hours. As it happens in countries where mining industries are established like S. Africa, Zambia, Tanzania, Australia, and Egypt, such workers often need training and certificates enabling them to work with heavy machinery. For example, heavy truck drivers all need a heavy vehicle driver's license.

The survey indicates that overall 62.2% of all the employees were of primary school graduate and below. The relatively low education among the majority of the current mining workers in Rwanda has implication on their efficiency and effectiveness and the overall production of the sector. These workers, particularly the 1,500 unskilled artisans who are already operating in the mining sector, individually or through cooperatives, need some basic mining

skills and basic communication/language (English/French) skills, health and business skills. They urgently require some kind basic training in the form of "Mining Extension Services" - short tailor-made courses near their places of work. In addition, the general low proficiency in technical and soft skills calls for mounting of tailor-made short and medium training courses to increase skills capacity of these employees in the mining sector.

Thirdly, as the Botswana and Egyptian examples (Box 2 and 3) illustrate, training in the mining sector in many countries is capital intensive, requiring fairly heavy investment. In the two universities the academic staff is highly qualified at doctoral level in the various aspects of mining. The staff student ratio is low at 1: 6. State-of-the art equipment and laboratories are also required for training. All these have an important bearing on not only investment in staff development, but also motivating them well and retaining them in such departments/faculties.

The survey has established that the staff training and the current status of staff in the existing science and technology institutions in Rwanda hardly reflect the reality of the two universities sighted above. Currently, training institutions have less than 40 per cent of staff in most departments that are qualified at the professorial and doctoral levels as many are at mainly at Master's level. It is understood that the failure to attract highly qualified staff is largely due to the low salaries, uncompetitive conditions and terms of service in the country in comparison to other areas of the public sector and also in the region. The poor remuneration has been a major setback in attracting and retaining qualified scientists in this particular sector.

So, if KIST, or any other training institutions in Rwanda, has to establish a faculty or departments of mining and/or geology, there will be a serious need to address the issue of conditions and terms of service, for both foreign and local staff, at the university. Competitive remuneration and attractive working environment will definitely attract qualified professionals from the region and beyond to sun such training programs.

Lastly, there is also the issue of provision of infrastructure and state of the art equipment and supplies. Once again as illustrated by the Botswana and Egyptian examples, high quality infrastructure and equipment is required in areas such as geochemistry, geophysics, hydrogeology, mining, metallurgy and others, for a faculty or department to train skilled professionals in mining industry. Therefore any institution in Rwanda, that intends to start a course in mining, will have to incur heavy investment in training equipment.

Currently no higher learning institution in Rwanda is equipped to offer mining programs. As the survey indicates, KIST, which was started to promote science and technology in the country, has most of its infrastructure and equipment in sorry state and can hardly be said to prepare high quality scientists. This was

evident during the discussions with academic staff at the institute. The 'voices' below vividly captures the state of equipment at KIST,

"The provision of equipment has also experienced a serious strain. Most of the equipment are said to be obsolete having been equipped at the time the institution was established. There has been little or no rehabilitation of the equipment given the high technological changes and innovations. The situation is exacerbated by the increasing budget cutbacks in public universities of government funding. For example, in this (2010/2011) financial year government funding to all public universities were cut by 25 per cent. This has an implication on renovation and upgrading such equipment as computers, which periodically require such a service" (Senior Academic member of staff, 2011).

"... that the maintenance of equipment was a major problem due to the poor staffing of technicians. Breakdowns of poorly maintained equipment as well as overcrowding in the laboratories seriously affect delivery in practical classes leading to greater emphasis on theory as opposed practical delivery" (Another Senior member of staff, 2011).

To avoid the challenged identified and ensure provision of quality training, there is need to structure the development of the training institution that addresses mining skill needs. The government and key stakeholders should avoid the current push to start the faculty of mining without putting into consideration requisite resources for improving the quality of training including financial, equipment and human resources. It will also need to develop its teaching programs in collaboration with the mining industry as is the case with the University of Nairobi, Department of Geology in Kenya with the Magadi Soda and Petroleum exploration companies among others.

The responsibility for enhancing skills development for the mining sector in Rwanda, in the next 3-5 years will rely on regional and international co-operations, with two options

- Rwanda should continue sending students and those already working for mining courses abroad for graduate and post graduate level programs, and
- Rwanda should enter into an MOE with regional and international institutions to come to Rwanda to offer upgrading and supporting courses to artisans and other low level technicians in mining.

These two options must be *shared by employers*, individuals, employer groups and government. These are responsibilities for mobilization of resources, developing demand-driven training programs, funding, and assessing the kind of training being offered in and outside the country.

In a nutshell, skills development for mining sector in Rwanda, which has already been privatized, is needed urgently but is of complex nature. It has to be tailor-made, flexible and have high quality targeting the market/labor demand from the existing and future establishments. Modalities of delivering such skills development programs (internally, regionally or abroad) must be discussed, weighed out, and alternative assessed before investment is made. What should be avoided is creating a faculty or department, which is not going to be competitive enough in offering quality programs for professionals and technicians for the mining sector.

5.2 Recommendations

5.2.1 Short Term Recommendations (6-12 Months)

1) Establishment of Sectors Skills Councils (SSC's)

The Sector Skill Councils are national partnership organizations that will bring together all the stakeholders – industry, labour and the training providers, for the common purpose of workforce development within the industry sectors. The sectors will be key in developing qualifications standards to ensure that the quality of trainees in technical schools, higher learning institutions and professional development stages is relevant and globally competitive. The SSC's will also be the center mechanism for coordinating school to industry linkages that provide work based experiential learning for skills development.

2) Promoting University-Industry Linkage in Rwanda

Creation and promotion of university-industry linkages for innovations and training should be initiated and supported. There is need for a national forum on university-industry linkage in Rwanda to discuss how to operationalise this important partnership.

Establish a fund for internships/attachments and innovations in the country. Such funds should be accessed in a competitive manner by innovators and top-experts in the manufacturing sector. Such a facility is to be used mentor young innovators' curiosity and interest, as it happens in Uganda, Kenya, Egypt, South Africa, where private companies are funding training and incubation facilities at various training institutions mainly universities.

3) Launching and Implementing Knowledge and Skills Development Training to Small-scale Miners

With regard to the training of artisans in the industry, the survey established that the mining sector has a skills gap of over 2,000 artisans and small-scale miners who need urgent training to increase their productivity and protect them from harmful effects of mining environment. They need training in small-scale mining and also in basic skills in literacy, communication (English/French).

Short courses training programs are needed to provide basic skills in geology, mining, literacy, communication (language – English/French), basic skills in health and safety practices, teamwork, and basic business management, and HIV/AIDs education. This could be through the principle of 'taking training to the artisans' through 'extension services' in partnerships with established institutions and mining companies in Rwanda.

The government and OGMR are to mount training programs for potential and existing small-scale miners in mining methods and business skills. Small-scale mining is in particular an avenue to promote women and youths' involvement in the mining sector.

4) Enhancing Qualitative Skills among Employees in the Private Establishment

Employees who responded to the survey indicated that they would like to be trained to enhance their capacities in 'soft' skills. Training program should target the following: Communication skills, Leadership skills, Risk Management skills, Result Orientation skills, Business planning and development skills, and Innovations & Managing change skills. There is need for district based capacity building programs.

5) Allocate some public fund for private sector Training of Mining Technicians

Build a case through PSCBS to allocate specific funds to support training of Mining technicians in Rwanda and outside the country for a period of 6-12 months. The main reason is that mining contributes significantly to the GDP of the country and is also a highly specialised and growing sector. In this regard, technical assistance need to be sought from countries in the region, with advanced mining industry such Ghana, South Africa, Zambia, Botswana, Namibia, Angola and Australia.

5.2.2 Medium and Long Term Recommendations (13 months to 5 years)

1) Establishment of Centre of Excellence for Training in Mining

Mining is an important sector of the economies of Eastern Africa region. Thus GoR in consultation with other countries, should explore possibilities of establishing a Center of Excellence for training. The facility should target the needed technicians and artisans - geologists, geophysicists, geochemists, mining engineers, seismologists and volcanologists. This could take the form of a regional center of excellence in one of the region's universities, or a collaborative program by several universities from the region. The latter approach may be preferred as it could tap into capabilities of universities that already have some of the core department.

2) Establishing Specific Scholarship Facility for Mining Courses Abroad

Establish dialogue between SFAR and PSCBS to establish a special scholarship facility to develop professional skills in mining including geologists, geophysicists, geochemists, mining engineers, seismologists

and volcanologists. To establish a pool of mining professionals within the next ten years, 5 to 10 scholarships per year should be given to students to pursue mining courses. The regional facilities at, for example, School of Engineering University of Dar-es-Salaam, Department of Geology Nairobi University and Makerere University in the EAC should be given priority because of cost implications. The beneficiaries of such facility should be bonded to work in Rwanda for 3-5 years after graduation.

3) Promoting Public Education in Mining Communities in Rwanda

Development of mining communities in terms of public education and other development initiatives are critical for the development of the mining sector. By promoting public education and stimulating other economic activities through skills development, mass media, education tours, community based workshops and seminars prepares and protects people from exploitation, destruction of the environment and engaging in risky and unhealthy lifestyles. In the long run this provides sustainable labor for the mining sector.

4) Supporting IPRCs to launch Mining related Course

As a way of strengthening the fast growing mining sector, it is important some TVET institutions, especially the IPRCs launch mining sector training skills targeting technicians and artisans in areas such as geology and environmental technology, hydrogeology, mineral and mining technology at certificate and diploma level. IPRCs will require trained instructors and lecturers as well laboratories and equipment in geology, mining and mineral technology.

Relevant ministries including MINERENA, Local Government, and other agencies to capacity build and empower rural communities, women and youth groups in particular, to develop local skills so that they benefit from the sector and contribute towards its growth.