The challenge of building local capacity to support the development of a sustainable mining industry in emerging mining nations

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Synopsis

Mining companies are increasingly looking to the developing world for the next generation of mining projects, often in countries that have little or no previous history of large-scale mining. One of the major challenges for such projects is hiring—and retaining—personnel that have technical skills and experience in mining-related disciplines.

Staffing a mine with an expatriate workforce is neither cost-effective nor sustainable, and many countries now insist that mining companies 'transform' the profile of their workforce to more closely mirror the demographic profile of the host population. The need to nurture mining-related skills in emerging mining nations is not solely limited to the workforce: there are also pressing economic and sustainability imperatives to develop capacity within local service providers such as consultants and contractors, as well as to facilitate informed engagement between mining companies, government and civil society.

However, few educational institutions in emerging mining nations currently have the ability to offer practical training in mining-related disciplines. Local employees who are sponsored by companies to develop their skills through international study may be impeded by language and cultural barriers, and may also be taught using course content that is of limited relevance to the specific challenges of their future working environment.

This paper addresses the challenge of skills development and retention in emerging mining nations and uses examples from sub-Saharan Africa and the Asia Pacific region to explore practical means of developing capacity in mining-related disciplines. It examines the need for companies to implement strategies to develop local technical capacity in countries where they envisage a long-term operational future and also highlights the need to foster partnerships between academia, developmental institutions, mining companies, governments and civil society to establish the critical mass of mining-related skills required to nurture the development of a sustainable mining industry.

Introduction

There is little doubt that the long-term future of mining lies in the developing world. The most attractive regions for future mining development are often countries that have long been recognized as having spectacular mineral endowments, but which have, hitherto not been the destination of major mining investment due to adverse political or social circumstances. This includes countries such as the Democratic Republic of Congo (DRC), Mozambique and Angola, which have emerged from civil wars in recent years, or countries which, until recently, have been effectively closed to 'Western' investment on political grounds, such as China and the Commonwealth of Independent States (comprising Russia and eight other of the former Soviet states).

One of the key constraints to developing mining and minerals processing projects in these regions is the acute shortage of personnel with the necessary skills and experience to develop and operate large-scale mining projects. This paper examines the challenge of skills development and retention in emerging mining nations by drawing on author's involvement with mining projects throughout sub-Saharan Africa and the Asia Pacific region with a view to identifying the key constraints for capacity building and proposing some practical strategies for addressing these challenges.

The way things were: expatriate staffing of projects

Historically, mining projects in the developing world have been staffed—particularly at a senior level—by expatriate ('expat') workers in order to compensate for a lack of locally available skills and experience. This approach still persists within multinational companies, particularly at early stages of project life. Expats may be hired on a fixed-term contract basis, or—if the project is being developed by a multinational mining company—employees of the parent company may be seconded to the project. Considerations which encourage mining companies to appoint expats to projects in the developing world include:

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- They are highly skilled, with previous experience of similar projects elsewhere, which should equip them to 'hit the ground running', with little need for additional training
- They should also be 'known quantities', particularly if they have been transferred internally within the company. This is a welcome comfort for managers—particularly during construction, commissioning and early mine life—when they are often beset with uncertainty that results from operating within unfamiliar geological and geographical settings, political systems and cultures
- Expats should lend flexibility to project staffing as they should have no expectations of security of tenure, and the end of their involvement in the project should have been defined from the outset in terms of pre-agreed criteria.

Although there is a strong perception that expats are generally middle aged white males, this is not necessarily borne out in reality. For example, almost half of the expats working on Anglogold Ashanti's Geita mine in Tanzania during construction, commissioning and early production were Ghanaian mining professionals (a legacy of the mine having been originally developed by Ashanti Goldfields), which brings into play a range of different cultural dynamics (Knol, 2001).

Deploying an expat workforce was—and still remains—a very effective means of getting a project off the ground during the early phases of project life when teething problems need to be ironed out and previous experience of the specific techniques and technology being employed is essential for dealing with the crises that may arise. However, staffing a mine with an expat workforce is neither cost-effective nor sustainable in the long-term. Thus, there is a pressing imperative to consider ways of developing capacity in the local workforce from an early stage of project planning.

The shape of things to come: localizing mining workforces

Increasing pressure is being brought to bear on mining companies operating in the developing world to 'transform' the profile of their workforce so that it more closely mirrors the demographic profile of the host population. Factors that encourage workforce localization include:

- Legislative and/or regulatory pressure, which may be triggered by political change and/or the rise of ideologies such as 'resource nationalism'. Resources nationalism is most prominent in Latin America due to the highly visible efforts of Hugo Chavez in Venezuela and Evo Morales in Bolivia to substantially transform their extractive industries, often to the point of nationalization. However, there are strong indications that resource nationalism is starting to affect the thinking—and policies—of governments elsewhere in the developing world, and has been a contributing factor to the review of mining contracts in the DRC (Magnowski, 2007) and increases in mining royalties in Zambia (Mathiason, 2007)
- Pressure from civil society (particularly host communities) to maximize employment opportunities for local people
- Recognition by mining companies that hiring local employees is less expensive than employing expats, and should also result in greater continuity of project staffing.

Although legislative and other pressures may give priority to the employment and development of local staff by mining companies, it is also important to recognize that the need to nurture mining-related skills and understanding in emerging mining nations is not solely limited to the company's workforce. In order to facilitate a stable and predictable environment in which mining companies can operate, there are pressing economic and sustainability imperatives to develop capacity within local service providers such as consultants and contractors, as well as within government and non-governmental organizations (NGOs) in order to promote informed engagement between mining companies, regulators and civil society.

Legislative and other requirements for workforce localization

In South Africa, the requirement to 'transform' the workforce to more accurately reflect the racial—and, almost uniquely, the gender—profile of the population has been facilitated through the Minerals and Petroleum Resources Development Act (Act 28 of 2002) and the Broad-Based Socio-Economic Empowerment Charter for the South African Mining Industry (more commonly known as the Mining Charter).

One of the stated objectives of the Mining Charter is to 'substantially and meaningfully expand opportunities for Historically Disadvantaged South Africans (HDSAs) including women, to enter the mining and minerals industry and to benefit from the exploitation of the nation's mineral resources' (Department of Minerals and Energy, 2004). In its preamble, the Mining Charter recognizes that prior to the political transition in 1994, non-whites (i.e. blacks, coloureds and Indians, who are collectively referred to as being 'black' in the legislation), host communities and women had been largely being excluded from meaningful participation in the mining industry. To address this historical imbalance, the industry has been forced to adopt an aggressive strategy to foster and encourage black economic empowerment (BEE) and transformation in terms of ownership, management, skills development, employment equity, procurement and rural development. This has resulted in the establishment of 'equity' targets including 10% female participation in mining and 40% Historically Disadvantaged South African (HDSA) participation in management by 2009. This is bolstered by requirements for the substantial equity transfer to BEE entities, for which successive targets of 15% BEE ownership of equity by 2009, increasing to 26% BEE by 2014 respectively have been established (Department of Minerals and Energy, 2004).

Even in countries that do not have such clearly stated transformation policies, legal mechanisms may be invoked to encourage the phasing out of expat staff and their replacement with local employees. In countries such as Namibia and Mali, there have been several instances where

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the government has been reluctant (or has even refused) to renew expat work visas where it is considered that companies have failed to show sufficient progress in developing and training local employees.

Challenges to workforce localization

Few would dispute that localization of mining workforces in the developing world makes good economic sense, as well as being a responsible and sustainable business practice, provided that it is carefully implemented. However, there are a number of challenges that may impede the rate of 'transformation', including:

- Language skills
- Lack of applied technical skills (particularly familiarity with large-scale mining activity and different types of mining and mineral processing techniques)
- Difficulty in accessing training and development opportunities for local employees
- Effectiveness of technology/skills transfer between 'expats' brought in to bridge the initial skills gap and the local staff identified to succeed them.

These challenges are discussed in more detail in the following sections.

Language skills

Mines run by international mining companies are most likely to do business in languages such as English, French or Spanish, which are often not the *lingua franca* of the country in which the project is located (let alone the mother tongue of the local population). Furthermore, people who pursue careers in technical disciplines may not have a natural affinity for developing the language skills required to do business in a foreign language.

The language challenge may be more complex than it might initially appear: for example, under the leadership of socialist-leaning regimes in Mali from independence in 1960 until the transition to democracy in 1991, the majority of graduates in mining-related disciplines studied in 'ideologically compatible' countries such as Russia and China. As a result, graduates in applied sciences such as metallurgy and hydrogeology who had to learn a foreign language to study overseas are often required to develop competence in yet another foreign language in order to be employed by the international companies operating in their country. Thus, in a francophone country where the dominant mining companies are English-speaking, technical professionals are very likely to be required to conduct business in their third or fourth language.

Applied technical skills

Certain countries that are undergoing an upswing in large-scale mining development, such as Mali and Burkina Faso, already have a long history of mining activity: for example, the Malinke Empire that ruled much of West Africa for nearly three centuries from approximately 1200 AD onwards was founded on wealth generated by Malian gold mining (American Forum for Global Education, 2000). However, these proud mining traditions are usually based on small-scale and artisanal mining, and these two countries have no history of large-scale metals mining prior to the 1990s. The transition from small-scale to large-scale mining requires a very different (more technical) skills set in terms of mining and minerals processing, as well as requiring a much more rigorous legislative framework to manage the financial, environmental and socio-economic risk profile associated with large-scale mining projects.

In certain technical disciplines, local people may already have educational qualifications that are potentially applicable to mining but do not necessarily have the relevant practical experience to apply their skills in a mining context; this is particularly true of geologists, for example, who may have extensive experience of field mapping through their work with national geological surveys, but may need training and development to hone their skills for application in a production setting.

Even where local personnel have mining experience, they may not have had previous exposure to the specific mining and/or minerals processing techniques that are to be employed by the project. This is particularly true where 'non traditional' mining methods such as block caving, mechanized mining or *in situ* leaching are to be applied, or where less conventional processing technologies such as heap leaching or acid pressure leaching are to be adopted. For example, New Caledonia has,'the longest history of mining of the Pacific Islands', stretching back to the onset of copper, nickel and cobalt mining in the 1870s (UNESCAP, undated). However, only with the large-scale commercial implementation of acid pressure leaching technology for nickel laterite projects such as Murrin Murrin and Bulong in Western Australia during the 1990s has it proved possible to fully exploit New Caledonia's enormous nickel laterite deposits. In the absence of local skills in this specialized area, developments such as Vale Inco's Goro Project have triggered an influx of expats to New Caledonia, particularly from Australia, who have practical experience of the design, construction and operation of such metallurgical plants.

Conflicts in academic mandate

The principal dilemma of any educational institution operating in the field of applied sciences is how to combine academic research with the development of 'hands on' practical skills required to implement economically, environmentally and socially responsible performance in an operational environment. In developing practical training tools for use in industry, it is not unusual for academic staff to encounter a degree of snobbery among their peers, whose commitment to pursuing academic excellence may lead them to regard 'contribution to capacity' as being less valuable than 'contribution to knowledge' (particularly where capacity building is undertaken for non-degree purposes). Even if educational institutions display willingness to participate in skills development, it is concerning that the number of mining schools worldwide has decreased at an average rate of at least one a year over the past two decades and projections predict a major shortfall between industry demand and graduate numbers (Phillips, 2006). Furthermore, through the mining boom of recent years, it has been extremely hard to attract—and retain—seasoned professionals within the academic environment who have skills and experience suited to practical capacity building for the mining sector.

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Can existing academic institutions provide capacity building to emerging mining nations?

Very few educational institutions in emerging mining nations currently have the ability to offer practical training in disciplines relevant to the mining industry, particularly in applied fields such as metallurgy, minerals resource management, rock mechanics and environmental/socio-economic risk management. Given the extremely limited in-house capacity of most companies to train their staff in house (and with the closure of corporate training facilities such as the Goldfields Academy due to the economic downturn in late 2008), mines in the developing world have little option but to seek assistance from outside the country—or even the region—in developing the technical skills of their local staff. Local employees who are sponsored by companies to improve their skills through foreign study may find their development impeded by language and cultural barriers, and may also be exposed to course material that is of limited relevance to the specific challenges of their future working environment, particularly if they register for courses that have not been customized to meet their specific requirements. For example, companies with operations in francophone West or Central Africa might decide to send their local environmental staff for training in French-speaking Quebec in the hope that staff will be able to acquire technical skills more easily if they are taught in their *lingua franca*. If however, the course content is not modified appropriately, consideration of issues such as permafrost and tundra ecology will be irrelevant to African conditions, and may prove confusing to students, thus potentially compromising the value of the training.

Effectiveness of skills transfer between expats and their local successors

In the past, expats have often been appointed to mining projects solely on the basis of their technical skills. However, in the context of legal and other imperatives for workforce localization, other considerations need to be taken into account.

It is no longer sufficient for expats employed on projects in emerging mining nations to display technical competence: increasingly they are also required to select, develop and mentor the 'local' successor that will ultimately replace them. This requires a somewhat different skills set to that which might have previously been sought by the project during its development, and includes consideration of the following:

- Language skills in the lingua franca (or at least a willingness to acquire these during their involvement with the project)
- Commitment towards developing the local workforce, which required both an ability to impart technical skills and a desire to build capacity
- Recognition of the temporary nature of their project involvement and the importance of meeting the full range of key performance criteria (including development and mentoring of their successor) as outlined in the contract of appointment.

The challenge of local staff retention

Recruitment and development of suitable skilled and qualified local employees may be hard: in parts of the developing world that are experiencing often explosive mining growth, retention of such individuals is unfortunately even harder. The risk to companies who invest heavily in the training and development of their local employees is that these individuals are then vulnerable to 'poaching' by competitor companies, many of whom may not have demonstrated the same investment in, or commitment to, staff development.

In South Africa, most of the larger mining companies who are listed on the Johannesburg Securities Exchange (JSE) have been prompted by Mining Charter requirements to invest heavily since 2004 in bursaries to support HDSA undergraduates—particularly women—in applied sciences such as mining engineering, metallurgy and geology (Reichardt, 2007). The provision of bursaries is an essential component of skills development in South Africa—and indeed, through most of the developing world—where the vast majority of students from historically disadvantaged backgrounds simply cannot afford to self-finance their tertiary education. The imperative to provide financial support to students entering the mining industry from 'non traditional' backgrounds becomes even more important where political pressure has been exerted on industry sectors to transform the racial and gender profile of their workforce to more accurately reflect the demographics of the country. However, once these bursars have graduated and gained some practical industry experience, they become vulnerable to 'poaching', especially by junior (particularly BEE) mining companies and non-listed competitors who do not themselves invest in bursaries and graduate development, but are willing to lure employees with offers of more lucrative employment packages. Such poaching is justified by these companies on the basis that in a free market economy, employees should be free to 'follow the money'. However, it is fundamentally unsustainable—and morally questionable—that companies that have played no active part in either increasing the number of graduates or diversifying the racial and gender profile of mining-related professions should then be able to draw from such a limited pool of capacity whose development has been supported by their competitors.

How can we effectively manage workforce localization?

Building on an understanding of the potential challenges that may compromise progress towards workforce localization, a number of opportunities to address these challenges in a practical and sustainable manner have been identified:

- Revision of academic priorities
- Relocation of capacity-building initiatives to operational regions in the developing world
- Establishing realistic targets for workforce localization
- Structuring of terms and conditions for expat contracts.

A range of potential strategies, which would allow the mining industry to address these opportunities, are discussed in greater detail in the following sections.

Recognition that educational institutions have a dual mandate

Quite simply, academic institutions need to rethink their mandates in the context of skills development within the mining sector. Whilst it is beyond question that universities

should strive to remain on the forefront of research, the 'less prestigious' (but arguably more industry-relevant) responsibility for capacity development—especially for non-degree purposes—needs to be considered, funded and appropriately prioritized.

In recent years, South Africa has seen a proliferation of short courses, often offered by centres of academic excellence affiliated with university departments that receive industry funding to address priorities that are common to the industry or the sector. These centres (such as the Centre for Sustainability in Mining and Industry, which is affiliated to the School of Mining Engineering at the University of the Witwatersrand) offer short courses that are recognized as part of the postgraduate curriculum, but do not restrict attendance to those who are registered for postgraduate studies. Students are welcome to attend courses as 'occasional' students, and courses are recognized by professional bodies (such as the Engineering Council of South Africa) for continued professional development purposes—an ongoing requirement that needs to be met by engineering and other professionals in order to retain professional registration. Certain companies—such as BHP Billiton—have gone one step further and have integrated courses from the postgraduate curriculum that are of particular relevance to their business into a customized 'suite' as part of their Graduate Development Programme.

Graduates know from their own experience that those academics who thrive in a research environment are not always best suited to imparting the basic skills and competences required to achieve responsible and productive performance on site. In recent years—perhaps prompted by the minerals boom—academia has been challenged by the difficulty of attracting and retaining professionals who have the necessary skills and experience to contribute to practical capacity building for the mining sector. However, one 'pool' of potential staffing that academia has not fully exploited is that of individual who might be seeking a 'career break'. Female engineers who are seeking greater work flexibility while their children are young, professionals with a desire to pursue their interests at a PhD level, people seeking to balance work and civil society priorities, or individuals approaching the end of their career who wish to 'give something back' to industry have a great deal to offer to academia—particularly on short-term appointments of three to five years. However, current university structures do not readily accommodate 'non career' academics, regardless of the value of their potential contribution. Considerations such as inflexible university hiring policies (with respect to age, gender and ethnicity), intellectual snobbery and a concerning dislocate between academic priorities and industry requirements may all conspire towards the sterilization of this potential talent pool, which the mining industry can ill afford.

Site-based as opposed to campus-based training

There is something faintly inappropriate about teaching applied sciences on an urban university campus that is physically and culturally remote from the sites where the students will need to apply the skills that they are seeking to acquire. In order to maximize the relevance and cost-effectiveness of training in remote mining locations, it seems inevitable that more consideration will need to be given in future to relocating capacity-building initiatives to operational regions in the developing world.

Consider local benefits

One of the most severe challenges for skills development in the developing world is the remoteness of most mine sites from institutions that are able to provide industry-specific training. In order for site staff to attend courses or workshops, they may need to travel long distances (often internationally), for which they need to plan well in advance, particularly if the candidate does not already have a passport and/or training is to take place in a country that requires the individual to obtain a work or study visa. The costs associated with course attendance may often far outweigh the course fee itself: air flights, passport and visa costs, accommodation and in-country transport, as well as the loss of productive time for both course attendance and travel (which, for students travelling from more remote locations, might exceed the time actually spent attending a workshop or short course) can easily consume the lion's share of the budget allocated for that specific training activity. Equally importantly, there are few (if any) economies of scale, as similar costs are incurred for each student who is sent to attend training at a remote site.

Presenting practically focused courses on a mine site or in a regional centre rather than on campus in a remote city would unquestionably prove a more relevant and cost-effective means of building capacity in operational staff. This approach would not only result in much lower per capita travel and accommodation costs for attendees, but would also provide predictable and relatively fixed costs in terms of travel and accommodation costs for the trainer (and other key presenters). This strategy would also provide enormous benefit by allowing taught sessions to be interspersed with on-site inspections to illustrate the application of theory learned in the classroom to practical situations. Furthermore, relocating capacity building to the mining regions should open the door for the inclusion of local experts to address region- and site-specific issues and challenges imposed by factors such as the local legislative framework, orebody characteristics and the environmental/social context.

Think inclusively and structure training to nurture relationship building with key stakeholder groups

Developing countries in regions that have burgeoning mining sectors are often characterized by undercapacitated regulatory authorities who may not have the ability and/or experience to implement the 'spirit' (or even the 'letter') of mining-related law: this is particularly true in respect of aspects of non-financial performance as environmental and socio-economic risk management.

This situation may be especially problematic where the mining-related legislation is relatively new or has yet to be tested in the courts: a fairly common occurrence in the developing world, where many 'mining codes' have been revised in the last two decades—often as aid or developmental initiatives—to promote mining investment. Research conducted by the Minerals Corporation in 2007 identified that the mining legislation in 63.9% of the 36 African nations for which data was available had been revised since 1990, and

that legislation in an additional 13.9% of the countries surveyed was under review (Minerals Corporation, 2007), leading to considerable potential for confusion over the intent and interpretation of legislation that is recent or whose key tenets have not yet been subject to legal challenge.

Relationships between mining companies and regulators may be further compromised by distrust between regulators and mining companies, especially where the mining sector in that country has a past history of poor governance, health, safety or environmental performance. It would therefore benefit all parties if aspects of training offered to mining company staff (and their service providers, such as contractors and consultants) could also be extended to include regulators from the relevant government departments as well as representatives of host communities and civil society. This would offer the opportunity to develop capacity in, and relationships with, key stakeholders in both government and civil society as part of an ongoing process of engagement to foster cooperative relationships with external stakeholders.

However, companies need to be aware that if they directly sponsor capacity building in regulatory authorities and/or civil society, then they may open themselves up to allegations of exerting 'undue influence' on these stakeholder groups. Should companies decide to include regulators and civil society representatives in their own training, it is therefore recommended that such events be coordinated through existing industry structures such as the national Chamber of Mines or the regional Mine Managers' Association, rather than being sponsored by individual companies.

Setting realistic localization targets

In the face of legislative and civil society pressure to transform the workforce, companies who are starting to operate in unfamiliar developing world settings are often overoptimistic about the degree and rate of workforce localization that can be achieved. There is a temptation to commit to well meaning but unachievable targets, especially where localization strategies are drawn up by human resources personnel who have undertaken insufficient consultation with technical personnel and do not fully appreciate the challenges that may constrain the training and development of local employees. As with all aspects of project performance, it remains far more prudent for companies to plan realistically so that the operation aims to 'underpromise and overdeliver' rather than vice versa. During the public consultation process, which is undertaken as part of the environmental authorization process, companies need to be extremely wary of misleading stakeholders over employment opportunities that will be available to local people, and both government and host community expectations of job creation—particularly during the early stages of project life—need to be tempered with reality. However, such prudence should not be seen by companies as an opportunity for not delivering on their moral (and, in some cases, legal) responsibility for training and developing local personnel.

Structuring the terms and conditions of expat contracts

Given the highly competitive, hard currency-denominated salaries and tax-efficient packages offered for many foreign postings, it is not difficult to appreciate why many mining professional become comfortable in their expat postings and might seek to prolong their involvement with a project beyond the point where their input is actually required. In order to avoid such situations, the terms of the expat contract need to be clearly defined at the outset with respect to critical details such as duration, key performance criteria, penalty clauses and contract completion bonuses. Conversely, if expats who have been provided with sufficient support and resources to identify and develop a local successor do not succeed in this objective, it should be self-evident that they should not be rewarded with a lucrative contract extension as a result of their inability to deliver on a key performance criterion.

Conclusions

The issue of capacity building and workforce localization in the mining sector of the developing world is critical, contentious and politically charged. It is abundantly clear that there is a need for companies to implement strategies to develop local technical capacity in countries where they envisage a long-term operational future. Equally, that there is a need to foster partnerships between academia, developmental organizations, mining companies, governments and civil society to establish the critical mass of mining-related skills required to foster the development of a sustainable mining industry in emerging mining nations. In doing so, conventional thinking—particularly on the role of academic institutions in 'hands on' skills development—and the implementation of locally based capacity-building training initiatives in remote regions needs to be critically re-examined, and, if needs be, revised to ensure that all potential sources of talent are accessed and harnessed in order to ensure that the current and future needs of mining are addressed in a sustainable manner.

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