

# Policy Practice Brief 7

## Is BHP Billiton's Cluster-Programme in Chile relevant for Africa's mining industry?

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### Executive Summary

The BHP Billiton (BHPB) Cluster-Programme in Chile is a strikingly novel initiative for developing more innovation-intensive links between the company's core mining operations and local suppliers in its host economy. It involves the application of well known principles of innovation system thinking and unusually a substantial investment in creating a demand for innovation as well as the more usual support to the supply of such innovations. The programme originated as a way of addressing industrial challenges in Chile, but it is also a component of BHPB's corporate social responsibility activities and this maps closely on to new perspectives about effectiveness in that area. By developing new thinking BHPB appears to be enhancing its own competitiveness while simultaneously contributing to the achievement of important societal aims. To use Michael Porter's terms, it is '**creating shared value**' – and, it appears, BHPB is doing so very effectively. Mere replication of the specific approach and practices of the Chilean programme is probably not relevant in most of Africa as few supplier firms have the level of capabilities of the Chilean suppliers, but there is considerable potential if the key elements of the BHPB Cluster Programme are designed and assembled in innovative ways that are appropriate to the African context.

### The Issues

Mining companies in Chile and most probably in other parts of the globe cannot achieve further rapid expansion by investment based on a continuation of technological 'business as usual'. They face at least four strategic challenges:

- Geological and environmental challenges
- Global shortages of skilled labour
- The need to gain a "licence to operate" from the people in whose countries

they operate by adding value locally.

- And the need to go beyond conventional Corporate Social Responsibility.

### *Geological and environmental challenges*

Mining companies in Chile, both existing players and a significant number of new entrants, face a combination of changing conditions. Four of these are especially important:

- The need to operate in changing geological conditions: in particular, a

This Policy Brief is the result of a visit by the two authors to Chile in March 2011 at the invitation of BHPB. The views in this report are those of the authors and do not necessarily reflect the views of BHPB or any other named organisation. Only the expenses of the two researchers were paid by BHPB. The Brief is based on information and documents provided by Osvaldo Urzua of BHPB and on eleven interviews with "suppliers" and other stakeholders carried out in Santiago between 16-19 March 2011.

continuing trend reduction in ore grade quality, the location of exploitable ore bodies at greater mine depths, and the changing composition of ore types.

- Increasingly constrained water resources for a water-intensive industry that operates for the most part in high-altitude desert conditions.
- Rising energy requirements for an already energy-intensive industry.
- Increasingly tight environmental standards and regulation concerned not only with water and energy use but also with emissions and waste disposal, as well as with issues about the health and welfare of those working in the industry and those living around it.

Mining companies that are committed to expansion in Chile are seeking new routes through this combination of pressures for much more intensified but also localised innovation.

#### *Global shortages of skilled labour and the wider global context of the company's initiative.*

A consequence of the Asian-driven worldwide growth of minerals production is that the industry's global shortage of high-quality engineering and related skills that had been experienced since the mid-1990s is expected to continue or worsen. This had pervasive negative implications for the costs, quality and timing of investment to expand and improve production, so threatening to undermine the ability to meet corporate growth plans.

#### *Retaining a "licence to operate"*

International mining has often been criticised for operating in an "enclave". The traditional enclave argument is that the core activities of the industry, being highly capital intensive, contribute very little to employment growth, while few links are made to supplier or downstream industries, so further limiting the industry's local economic impact. At the same time, with almost all its financing raised in foreign capital markets, most of the local industry's profits and capital growth accrue in other economies. Hence its contribution to longer-term development depended largely on the scale of tax, royalty and other income streams governments negotiated with the mining companies, and – just as important – on what the state does with those receipts.

However, the reality of how the industry operates in these countries has altered over the years. Changes in the world wide organisation of the industry since the 1980s, in particular the greatly increased out-sourcing of equipment and services used by global mining companies, have increased opportunities to stretch these enclaves much wider than was common in earlier decades. Linked to the greater scale of mining in many countries, these opportunities have been grasped by growing numbers of upstream suppliers and, to a lesser extent, downstream processors located in the domestic economy. These have been both locally owned firms and affiliates of international companies.

#### *Going Beyond Conventional Corporate Social Responsibility*

The traditional approaches to corporate social responsibility (CSR) are also undergoing substantial change. Historically expenditure for CSR often appeared to be treated as the tax companies have to pay for the "licence to operate". Often these activities lay outside the core competences of the parent company, involving "community development" such as the building of hospitals.<sup>1</sup>

While there may be good arguments for large companies relating more positively to the (poor) communities in which they operate, there is an increasing trend to see how to expand activities that have a positive contribution to the bottom line and also contribute to the wider social and economic concerns of the local (host) economy.

The requirement for mining companies to be perceived as 'good citizens' involves not only the need to add value over and above sharing the rents with the local state but also the need to engage more fully with the local economy and to counter the tendency for mining operations to operate in isolated enclaves.

In Chile the initial focus was on extending production links. Now there is an increased focus on "embedding" mining operations more fundamentally into the local economy.

This change in the direction of CSR also opens up new opportunities for the state, large private

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<sup>1</sup> This trend was recognised by Professor Michael E. Porter, at the Harvard Business School when he noted in November 19, 2009 that "CSR and community issues are treated as separate from the core business agenda".

corporations and aid agencies to work together in new forms of practical partnership.

### **The Cluster Programme's response**

The BHP Billiton Cluster Programme has added a new dimension to what Porter describes as the creation of “shared value” by developing a new way of managing procurement from a segment of its supplier base in order to create suppliers that are stronger and smarter and are able to innovate on a global stage<sup>2</sup>.

BHPB seeks to achieve a win-win outcome for the company itself and for the development of the local economy.

On the one hand the new approach is designed to meet its own needs for innovative solutions to problems and opportunities in a growth scenario that envisages a rapid expansion in such needs.

On the other hand it aims not merely to draw on the existing competences of suppliers but to strengthen both their innovation and wider business capacities – a cumulative process that should enable these firms, and hence the local economy, to capture a larger share of the industry's rising demand for relatively complex and knowledge-intensive goods and services both in Chile and also internationally.

The emergence of BHPB's plans in this area were informed by insights from its earlier Australian experience in which the interactions between mining companies and suppliers had played a major role in contributing to the emergence of world class suppliers in Australia during the 1980s and 1990s.

The company's plans were also guided by understanding of the changing situation in Chile, in particular the recognition that it will no longer be sufficient to rely on innovation undertaken in globally centralised locations in the international mining companies and suppliers of equipment and engineering services. These locations are too remote from operations in Chile where it is increasingly evident that the changing context requires innovative, problem-solving suppliers to be much closer to investment projects and operations in that specific context – hence having the comparative advantage of knowing

the precise conditions of the local physical, political and economic environment.

What matters therefore is the strength of the innovative capabilities of locally located suppliers of equipment and services – whether these are locally owned or the affiliates of multinational companies.

But meeting this need was also seen as facing a key constraint. Although there are approximately 3,000 local suppliers to the industry, a sample survey in 2008 showed only very few as significant innovators. Most (67%) were users of existing technologies and only 31% had the capabilities to adapt available technologies.

The company therefore developed an approach that sought to increase the innovative capacities of locally located suppliers within the framework of specific projects undertaken with individual suppliers.

Known as its ‘Cluster Programme’, the company's initiative in this context involves reshaping conventional modes of procurement from local suppliers in ways that are specifically designed to open opportunities for them to develop innovative solutions. This is matched by parallel activities designed to strengthen their abilities to produce such innovation, together with their broader capability base to develop into world-class suppliers. The longer term aim is to enable these local firms to capture a larger share of the industry's rising demand for complex and increasingly innovative goods and services in both Chile and wider international markets.

To meet these aims BHPB identifies needs for particular innovative solutions, engages supplier firms to meet those needs and provides a framework to test out ideas within real-time operations with its own managers and engineers during the supplier's technology development process.

But in addition, BHPB engages external consultants to provide suppliers with advice and training about selected managerial and organisational competences required to achieve world class business performance, and require links be established with local research at universities.

The novelty of the Cluster Programme arises in large part from the fact that the demand for innovation is being articulated by a source (BHPB) which has strong purchasing power:

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<sup>2</sup> Michael E. Porter and Martin R Kramer, “Creating Shared Value” Harvard Business Review, January-February 2011.

most innovation policies implemented by governments are only able to focus on strengthening 'the supply side' of the innovation process.

### **The Implementation Process**

The company's aims for the scale of the programme were that it would start with an initial phase (2008-09) involving 12-15 firms with innovation projects in five key problem areas. The number of participating firms would be rapidly expanded to around 100+ by 2010-2012. A longer term target for the impact of the programme was that more than 250 participating suppliers would have made the transition to world class status by 2020.

#### *Identification and screening of BHPB needs and opportunities for innovative solutions*

BHPB staff in a newly formed 'Cluster Unit' undertook a major review of potential projects across the whole array of the company's exploration, mining and processing activities in Chile. This drew partly on existing review procedures for identifying innovation needs to be channelled to the company's own R&D and engineering teams, but it also involved additional interaction with managers and engineers in the operating units – more than 120 interviews in the first phase<sup>3</sup>.

#### *Pre-screening of potential suppliers*

In each of these areas possible suppliers were also interviewed and screened in terms of both their likelihood of rapidly developing a breakthrough in solving the problem, as well as their longer-term potential for, and commitment to, achieving world-class supplier status. More than 60 firms were screened in the first phase.

#### *Identifying the core cluster nuclei*

In synthesising the screening of priority problem areas and potential suppliers the Cluster Unit attached considerable emphasis to 'quick wins' that would yield, identifiable gains to demonstrate to BHPB managers and engineers the practical returns that could be expected from cluster projects in future.

Each priority problem area and a small number of selected suppliers constituted a cluster

'nucleus'. There were five such nuclei in Phase One with two to three firms in each.

#### *Integrating Procurement, innovation and capability development.*

A striking feature of these projects so far is that they have required the main task force participants to make quite fundamental changes in their usual procedures and routines. Particularly important has been the fact that the standard BHPB procurement process more or less precludes innovation by suppliers. It has been designed to be highly efficient in obtaining goods and services at least cost; and for such a transaction to be undertaken, the specifications of what is to be purchased has to be tightly defined ex ante by the company and standardised for all potentially competing suppliers. That is a necessary basis for competitive tendering, progress monitoring and payment authorisation, but it is ill suited to purchasing a new way of doing things that is in some degree unknown and non-specifiable in advance of commitment to a transaction.

#### *Defining the supply requirements*

The key to opening up a space for innovation in the procurement process has been to change the way the supply requirement is defined. This has involved broadening the question posed to the supplier – starting with a more open-ended presentation of the problem or opportunity faced by the company, not by setting out the expected solution to it.

In some cases the process of opening up the definition of the problem also involved integrating aspects about related elements of a system that had previously been the subject of separate contracts. For example:

- with respect to dust control in processing, to define the requirement in terms of air quality improvement, not as a particular type of equipment;
- In the case of supply of wire ropes for excavation shovels, to define the requirement in terms of increasing the operating time availability of the shovel (by reducing the duration and frequency of downtime for rope-changing), not in terms of new specification for wire rope.
- In a project to improve the processing of mine tailings, to seek alternative ways of increasing water recovery, not pre-specified types of process design.

<sup>3</sup> This process of identification was itself built on an earlier experiment in "participatory innovation" (this is described by Alfredo del Valle in "Participatory Innovation: an effective model for high-complexity innovation management", The 3<sup>rd</sup> ISPIIM Innovation Symposium, Quebec City, 12-15 December 2010.

- In a case involving maintenance services for deep water boreholes, defining the requirement in terms of the performance of the system as a whole - e.g. (litres/second) – not in terms of specified services to be provided for the component parts of the system.

### *The process of strengthening world class competencies*

With BHPB meeting a substantial fraction of the costs, consultants provide support for suppliers in addressing such issues as the strengthening of internal processes, teambuilding and leadership; the development of strategy, culture and brand identity; and the deepening of innovative technical capacity. Their progress in achieving targets in these areas is monitored along defined schedules.

### **The lessons learned so far**

It is too early to assess the outcomes of the Cluster Programme, but the signs are very positive. Preliminary internal estimates by BHPB suggest that, taking account of all the company's costs – including large components of the costs of consultancy support for the supplier firms, the benefits from the innovation-centred projects with suppliers yield high internal rates of return and rapid pay-back. Interviews with suppliers that have participated in the programme suggest they too have achieved significant benefits, both short-term and strategic, that contribute to the development of their paths to world class supplier positions.

Looked at more broadly from the perspective of the local economy, there are strong signs that this development of suppliers' innovative and wider business capabilities is contributing to the emergence of a qualitatively stronger and smarter supplier sector in the economy. These developments suggest that BHPB is increasingly able to demonstrate a corporate position in which it is much more strongly and creatively embedded in its host economy. The programme shows every sign of delivering win-win outcomes for the company and the local economy. An external validation of this is the fact that Codelco, the state owned mining company in Chile, has embraced the basic principles of the Cluster Programme and is now collaborating with BHPB in extending it across both companies.

The BHPB Cluster Programme was also reported to provide other government support programmes with a clearer analytical framework in which to design and target their interventions more effectively in support of the mining sector.

Beyond that, the BHPB initiative to develop a richer base of world class engineering and managerial competences will contribute to addressing a serious challenge facing the global mining industry as a whole: a global shortage of such competences for both mining companies themselves and for the more knowledge-intensive of their supplier industries. In other words, this initiative may be heading for a triple-win outcome - for the company itself, for its local host economy and for its global industry.

*A new kind of contracting: “why did you not tell us this before”, “you never asked”<sup>4</sup>.*

As noted, a major challenge for the Cluster Programme has been to create space for supplier-centred innovation in areas of the company's procurement. This has involved change in four main areas: (i) the way the supply requirement is defined, (ii) the way the engineers and others in the operating units and the supplier firms interact within the task team, (iii) the form of contracts and related procedures, and (iv) the use of facilitating third-party consultants.

Re-framing the way the mining company's problems were defined has not resulted in loose definitions of the supply requirement. But rather it has resulted in different kinds of tight and detailed specification, usually couched in terms of change in the performance of the operating process rather than the supply of goods and services – for example raising water recovery from mine tailings by 20%, reducing acid mist to 0.55 mg/m<sup>3</sup>, maintaining sustained borehole water flow at a specified rate of litres/second.

In addition the company is currently working on ways to clarify the ownership of the Intellectual Property Rights associated with the solutions created under the Cluster Programme. It is also developing its “exit strategy” from activities concerned with developing and

<sup>4</sup> Conversation reported between a BHPB engineer and a supplier's senior engineer working on a cluster projects concerned with water recovery from mine tailings.

assessing the general competences of suppliers in order to avoid participation in the Programme being seen as a pre-qualification or certification process for suppliers tendering for subsequent contracts.

### The Relevance for Africa

The obvious question then arises: might this type of programme be applied in other contexts with expectations of similar win-win outcomes?

A positive answer seems appropriate at the level of broad principles underlying the BHPB programme because several of them seem applicable in a wide range of contexts, including Africa. These include the importance of:

- linking corporate social responsibility to activities involving core company competences;
- using that linkage to create shared value via modes of supply chain development;
- recognising that important areas of society's human capital development must necessarily take place **within** firms (not only in institutions like universities);
- so seeking to extend supply chain development beyond strengthening compliance with standards (technical, commercial, environmental, human rights, and others) to embrace the development of supply chain competences;
- leveraging the mining companies' demand to strengthen investment in skills and knowledge by supply chain partners.

But broad principles are one thing and specific approaches and practices are another; and wide experience of development suggests that merely copying the latter and transferring them into different contexts is most unlikely to be effective. It is therefore important to identify such specific features of the BHPB programme. Two seem important.

- The complexity of the technological challenges faced in the innovation projects undertaken with the suppliers: a changing array of innovation projects with increasing complexity across the spectrum from relatively 'incremental'

forms of innovation to those at the international frontier.

- The level of the supplier firms' existing capabilities: holding the potential to reach 'world class' capability levels with respect to both technological innovation and broader business competences.

Consequently, preconditions for the programme included the existence of supplier firms that were already on the edge of being capable of innovation and had the potential to pursue the expected trajectory towards world-class capabilities. By the mid-2000s (and indeed earlier) the supplier industries in Chile included a significant number of firms that could meet these conditions, and the initial supplier screening process for the programme in the late-2000s was able to identify a substantial initial base of firms with the necessary competences to participate.

In other words the expected trajectory of supplier development in the BHPB programme lies beyond the scope of conventional supplier development programmes. It also seems to lie beyond the scope of what would be feasible in most Sub-Saharan African mining economies.

#### *Sub Saharan African Mining economies<sup>5</sup>*

South Africa has already developed a strong and innovative mining-related supplier sector. This is already based on world-class capabilities and, although they need strengthening and deepening in order to sustain and enhance competitiveness, they are well beyond the stage for a BHPB-type programme to foster their initial development.

But other sub-Sahara African countries (SSA) have only pale shadows of the South African patterns of competence creation, incubation, spill-over and spin-off. In some of the more mature and/or larger mining economies (e.g. gold mining in Ghana or copper mining in Zambia) there appear to be a few supplier firms that are engaged in supplying goods and services for use in the core exploration, mining and primary processing activities. However

<sup>5</sup> This section draws heavily on initial results of a joint research programme of the Open University (UK) and the University of Cape Town (South Africa): The Making the Most of Commodities programme. Discussion papers can be found covering the mining industry in Africa in general (# 4), and in Ghana (# 1), Zambia (# 3); South Africa (# 5) and Tanzania (# 7) at: <http://commodities.open.ac.uk/discussionpapers>

they seem to be better characterised as having 'Low' technological complexity and 'Low' firm capability relative to the Chilean firms participating in the BHPB Cluster Programme. In particular very few of them – either local affiliates of international companies or locally owned firms - appear to engage in even minor innovation activities. It seems very unlikely therefore that more than a small handful of firms would meet the 'entry requirements' for a BHPB-type programme.

A significant need in the local supplier context in SSA mining economies is about developing much larger numbers of individuals with 'capabilities to supply relatively knowledge-intensive goods and services for use in the industry's core activities. There are some individuals 'with basic training in mining-related engineering or similar disciplines, and also with at least some elements of industrial experience (e.g. as employees of mining companies). However, although these competencies may in some cases already constitute a **potential** basis for local supply activities, they are few in number and even fewer are engaged in supplier **firms**.

It is clear that an activity designed along the specific lines of the BHPB Cluster Programme in Chile would not be effective in SSA contexts. But there does appear to be considerable potential for linking the technological and managerial competences of existing mining and related companies to achieve significant societal purposes via the development of stronger supplier industries in those economies. However the specific approaches and practices required to do this would need to be very different from those undertaken in the BHPB Cluster Programme in Chile.

### **Immediate requirements in Africa**

The challenge for developing mining industry supplier clusters in relatively knowledge-intensive product areas in Africa lies in the **early-stage** development of suppliers. This has two aspects.

The first centres on the creation and incubation of **new firms**. Such new venture creation is well recognised as a risky activity where market and system failures are significant. Consequently public intervention is common. But models for such intervention have been shaped by the context of advanced economies where the focus has been on fostering the

development of 'high-tech' new ventures with products derived from recent R&D - often frontier-R&D undertaken in organisations like universities and advanced research centres. In the case of the mining industry in Africa, as in the earlier development of supplier firms in Chile, the new venture problem is largely about entry into market areas involving established technologies and their incremental improvement 'behind the frontier'.

The second is about creating and accumulating the necessary competences of **individual technicians, engineers and managers** who would directly underpin the emergence of relatively knowledge-intensive supplier firms. This involves difficulties that cannot be addressed effectively by the more common kinds of human capital development.

In particular the required skills cannot be achieved solely by education and learning activities located in public organisations like universities or colleges. The required skill and experience can only be acquired *inside* industrial enterprises on the basis of actively managed training and experience acquisition programmes running over significant periods of time. This means that the mining company (or supplier company) has to have made the prior complementary investment decision to set up and manage the required training and experience acquisition activities.

Thus, even if there were extensive improvements in public education and training in mining-related areas, the heart of the process of supplier cluster development in African contexts is about industrial firms committing expenditure to investment in the necessary human capital.

Thus, alongside strengthened education and training institutions and intensified measures to foster training by all kinds of firms in the industry, what is required is a process that induces larger and more knowledge-intensive firms to intensify their investment in engineering and managerial skills and experience. The purpose would be to generate social returns extending far beyond the 'accidental' spill-overs that might arise from the scale and types of investment in human capital that they would normally undertake in their own private interests.

That seems to call for co-ordinated action in three areas – three components of an African mining cluster development programme.

### *Financing*

A channel of funding is likely to be needed to finance investment in specific projects and programmes of knowledge-intensive human capital development by the larger and more knowledge-intensive firms with mining operations in African countries – both mining companies and larger international supplier firms. The purpose would be to provide quasi-public (developmental) funding to extend such programmes and projects beyond the scale and type that would be adequate merely to meet the private interests of the firms. In contemporary African contexts, and with specific reference to mining, such financing might be provided by development banks and national mining companies, perhaps supplemented by CSR-type resources of larger international mining firms and their suppliers, and by official development assistance.

### *Incubation and accumulation*

Enterprises in the industry are needed to act as the incubators and initial accumulators of the growing stock of human capital. In contemporary African countries national mining companies may be able to play this role in circumstances where they have significant direct operational involvement in production. In other situations, larger international firms might be contracted to play such roles, perhaps

seeing such activity at least in part as a component of their CSR programmes.

### *Regulation*

Common responses to 'market failure' in connection with firms' training and human capital development have involved elaborate tax/grant schemes or regulatory 'requirements' to undertake training. The former are often administratively far too complex, while the latter have considerable limitations as generally applicable measures.

However, a regulatory environment fostering human capital development in specific industries and priority fields can have positive effects when linked to licensing regimes as commonly present in the mining and petroleum industries. In Nigeria, for example, the regulatory framework in recent years appears to have fostered the emergence of a more significant market in training services around the core firms in the industry.

These three components of a cluster development programme in Africa would almost certainly have to be designed and assembled in different ways in different national contexts. But, as a longer term aim, inter-country co-ordination would be likely to yield considerable benefits.

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